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JOURNAL OF
Agriculture

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Minister of Agriculture.

This month's cover

Haymaking equipment being taken out on to a paddock on a Thornton (Bay of Plenty) farm is the subject of this month's cover. It has been reproduced from a natural-colour photograph by Atkinson and Finney. In New Zealand hay and silage made from surplus growth of pastures are the most widely used supplementary feeds for stock. Modern harvesting machinery such as the pick-up baler and the tractor with mower-blade attachment have speeded up harvesting work, making it possible for farmers to save larger areas of pasture and reducing losses resulting from wet weather.

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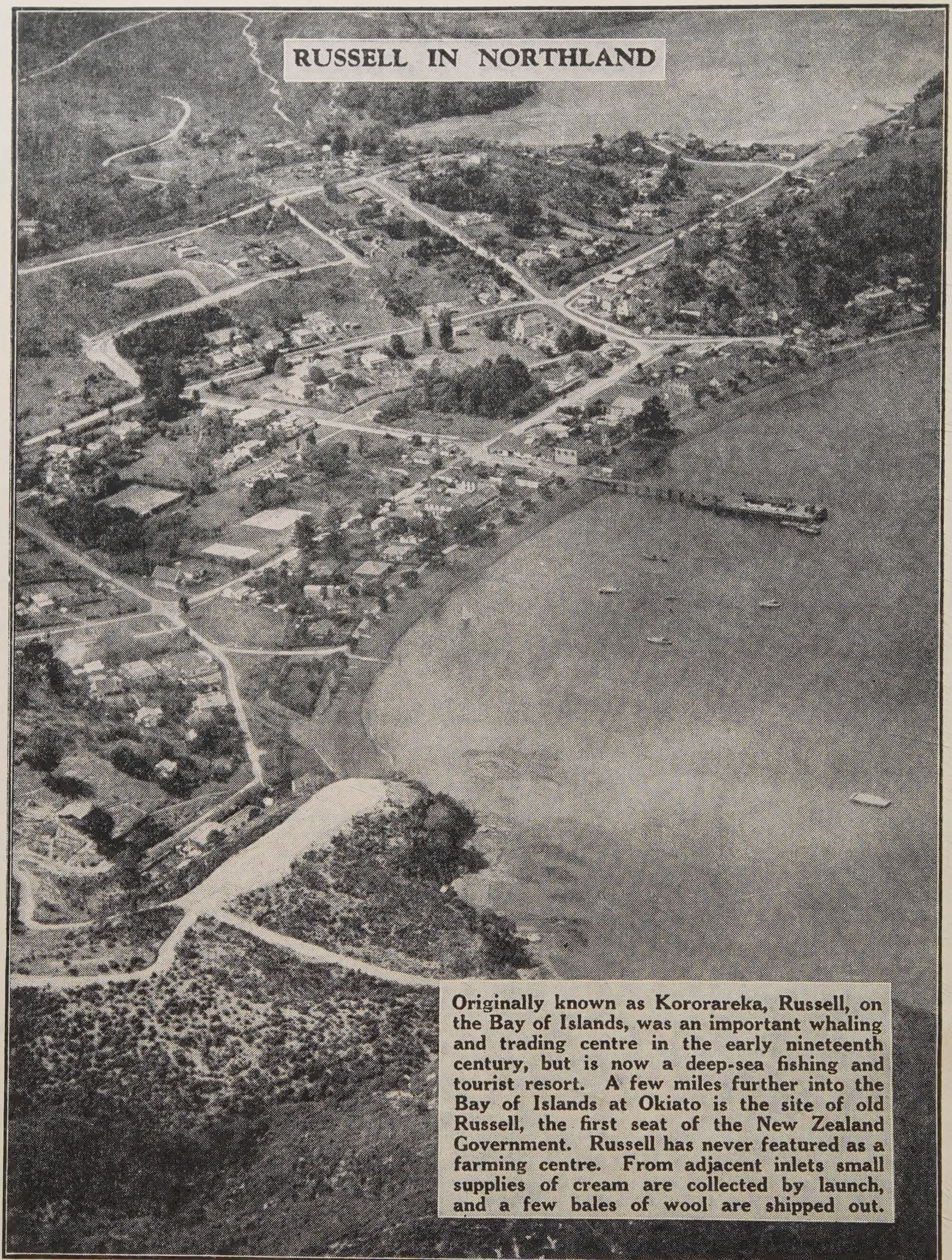
DEC 1950

RUSSELL IN NORTHLAND



Originally known as Kororareka, Russell, on the Bay of Islands, was an important whaling and trading centre in the early nineteenth century, but is now a deep-sea fishing and tourist resort. A few miles further into the Bay of Islands at Okiato is the site of old Russell, the first seat of the New Zealand Government. Russell has never featured as a farming centre. From adjacent inlets small supplies of cream are collected by launch, and a few bales of wool are shipped out.

[V. O. Browne photo.

The Potato Board: Stability of Production and Prices

THE principal function of the Potato Board, set up under the Potato Growing Industry Act, is to ensure that an adequate supply of main crop potatoes is available for consumption in New Zealand. The Government realises that the aim can be achieved only if growers are assured that the crop remains a payable one, and the board's activities will be directed toward seeing that production is sufficient to meet requirements and that any over-production does not glut the market.

Fluctuations in yields are perhaps greater with potatoes than with any other crop, and because the product is perishable, in years when no controls operated shortages or surpluses were quickly reflected in price fluctuations. In one season prices advanced to £20 per ton; in the next they receded to £2 per ton, sufficient only to recover the cost of digging, bagging, and delivery. Growers who sold in the season when the price was £20 per ton had relatively few potatoes to sell; those who sold at £2 the following season could dispose of only a portion of their crop. Under such conditions price fluctuations become accentuated by the attitude of growers who grow larger acreages in seasons following high prices and smaller acreages following seasons of low prices.

Wartime Production

In the early stages of the war the acreage devoted to potato growing fell to a record low level due to difficulties associated with the shortage of labour. About that time a greatly increased demand in the form of army requirements arose and the then Government entered into contract with growers to pay for all the potatoes produced under contract even though the market for them should have terminated. After the war the contracting system was continued to ensure that supplies of potatoes were maintained, though its application was limited to main crop potatoes.

In 1948, though the total potato acreage was estimated as about sufficient to produce requirements, there was a surplus of 20,000 tons of main crop potatoes because of an exceptionally high yield.

In 1949 the acreage was still below that estimated to produce sufficient potatoes and because there was only an average yield, there was a deficiency of 10,000 tons. Private importers managed to obtain 3200 tons from Australia, but to enable these to be sold at the same price as New Zealand potatoes, £20,000 was paid out in subsidy.

In 1950, with an acreage still below that needed normally to meet requirements, a high yield has led to estimates of a surplus at the end of the season of perhaps 7000 tons. Fortunately a market for this quantity has been found in Australia.

The industry (growers and merchants), expressing its views through the Potato Advisory Committee, was disinclined to revert to the pre-war system of marketing and the Government acceded to the wishes of the industry by passing the Potato Growing Industry Act. This Act gives growers a fair measure of that producer control of industries which my Government favours.

What is required in the industry is a reasonably stable acreage and machinery to deal with shortages or surpluses due to variations in yield. I am satisfied that the Potato Board, which will be an independent body consisting of three representatives of the growers, three representatives of the produce merchants, and one advisory member who will be a member of the Public Service, will be capable of operating a scheme which will protect both consumers and growers.

Provision for Levy to be Made

The board has the power to make a levy not exceeding 13s. a ton in respect of main crop potatoes in districts which, from time to time, the board may determine. The purpose of the levy is to establish a fund from which the administration expenses of the board will be met and sums incurred under contracts made with growers for the growing of main crop potatoes will be paid.

In some years exports have been made to Australia and South America, but those markets are too uncertain for New Zealand growers to rely on exports as a means of disposing of surplus potatoes. However, subject to the approval of the Minister of Marketing, the Potato Board is authorised to arrange exports if markets are available when surplus production occurs. There is provision in the Act, too, for the Minister to direct the board to arrange for imports of potatoes.

Realistic Approach by Growers and Merchants

I am most gratified with the manner in which both growers and merchants have been able to arrive at a solution to a problem which affects one of our most important industries. The Government and myself recognised in their proposals a realistic approach which could be translated readily into legislation. I have often stated that I welcome recommendations for improving existing conditions in any of our primary industries. It makes my task much easier when recommendations are as well presented as were those of the potato industry by its representatives.

I am confident that the Potato Board will be able to operate within the existing distribution channels a scheme which will meet all contingencies yet preserve as nearly as possible a balance between production and requirements.

—K. J. HOLYOAKE, Minister of Agriculture.

CARE OF LIVESTOCK DURING NOVEMBER

Contributed by the Animal Research Division.

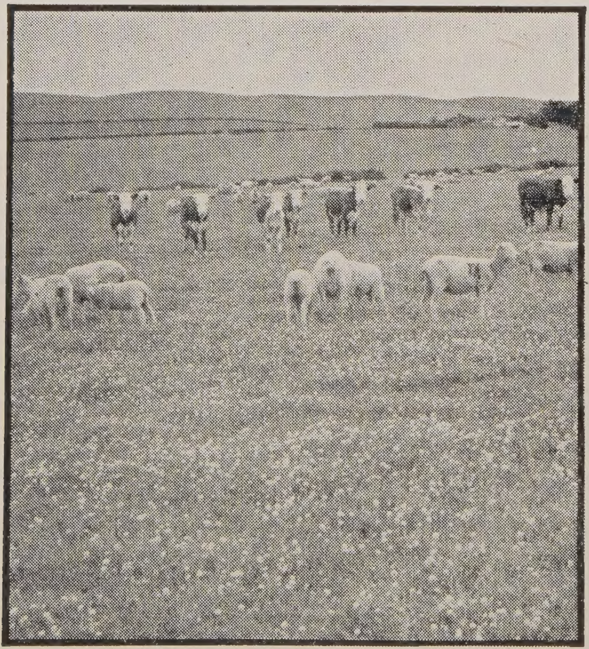
DRY EWES

IF dry ewes have not already been removed from the flock, they should be separated immediately. It is a good plan to shear them and during shearing they should be inspected carefully for udder abnormalities. All ewes whose udders were empty at lambing and ewes with diseased udders, damaged teats, very large teats, very small teats, or badly placed teats should be culled. Dry ewes with defective mouths and old ewes which did not have a lamb this year should also be culled. Dry ewes which are retained should not be allowed to get too fat during summer. If kept in hard store condition, they are more likely to hold when mated next autumn.

* * *

VACCINATION AGAINST CONTAGIOUS ABORTION

Vaccination has been very successful in preventing contagious abortion. More than 200,000 heifers have been vaccinated in each of the last 2 years. There were, however, more than 100,000 heifers which were not vaccinated. Freedom from abortion in the past is no excuse for not vaccinating, as infection may be introduced into a herd at any time. Although vaccination does not commence until January or February, vaccine should be ordered now, as Veterinarians and Inspectors of Stock have to plan their vaccination itineraries. Late orders make the planning very difficult.



CONTROL OF FAT-LAMB PASTURE

Pastures on which ewes and lambs are grazing should never be allowed to become rank. If pastures are getting too long, they can best be controlled by cattle. Yearling beef cattle soon become quiet and they can then be run with ewes and lambs even in small paddocks. If no cattle are available, it is better to add dry sheep than to increase the number of ewes and lambs.

* * *

HILL STATIONS

Where bidi-bidi comes away early and is troublesome, ewes should be shorn toward the end of November. Cull run cows not required for breeding. Brand calves and handle them as opportunity permits. In warmer districts put bulls out with the breeding herd. Where water is not laid on, attention should be given to dams and springs, so that water supplies will be plentiful during the hotter weather.

* * *

MATING OF DAIRY COWS

Before each cow is mated two open heat periods or an interval of at least 30 days should be allowed after calving. Cows mated before this period are less likely to get in calf, and the chances of contaminating the bull are increased. Hand mating should be practised and accurate records kept showing the bull used and the dates of all services. Should breeding trouble occur, these records will be of considerable assistance in arriving at a correct diagnosis.

* * *

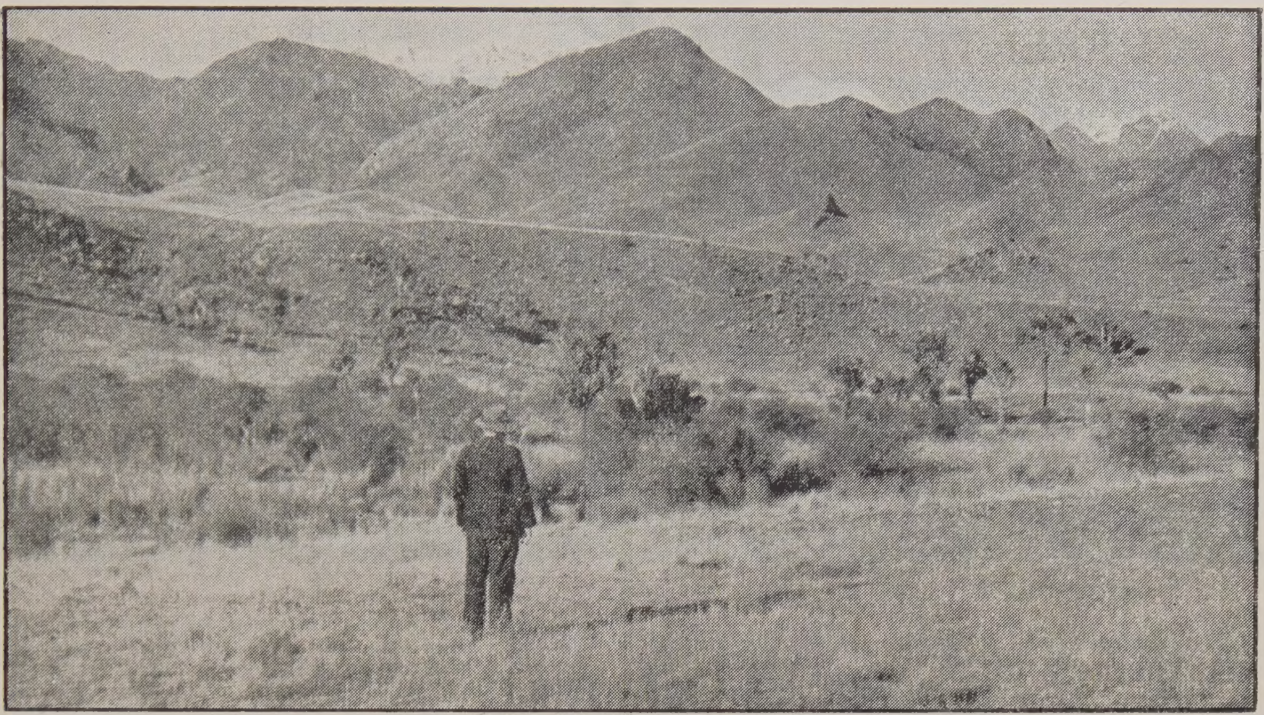
GRAZING MANAGEMENT OF DAIRY PASTURES

An increasing number of farmers are using the electric fence for feeding off autumn-saved grass. This practice could well be extended to the grazing management of spring pastures. It is a convenient and economical method of obtaining closer subdivision and makes possible more efficient utilisation of available feed. In addition the longer spell between grazings encourages grass growth and leaves more grass available for conserving as silage or hay.

* * *

CARE OF PIGS

Dry sows should have access to good pasture, and in addition should receive from 2 to 4 gallons of milk per day, depending on their condition. They should be kept thriving, but should not be allowed to become too fat. Only as many of the spring litters should be kept for baconers as can be fed adequately and the remainder should be sold as porkers.



Improvement of Tussock Grassland

By T. G. SEWELL, Instructor in Agriculture, Department of Agriculture, Christchurch.

THE high-country tussock grassland of Marlborough has been occupied for pastoral purposes for almost 100 years. During that time the land has been burned repeatedly, heavily stocked with sheep, and infested with rabbits. When it is considered that tussock grassland evolved in the absence of grazing animals and there has been little attempt at improvement, it is remarkable that it has continued to run sheep and produce wool. Although the more palatable grasses and herbs have been reduced in number and in part eliminated, the decline in carrying capacity has been offset by certain introduced species such as catsear, Yorkshire fog, browntop, and sweet vernal, but there has been no concerted effort at surface sowing. This article describes the methods used in surface sowing of tussock grassland with cocksfoot and the results obtained.

CAMDEN RUN, which occupies 20,000 acres, is favourably situated on the south side of the Awatere River valley, in Marlborough, having on the whole a northerly to north-easterly aspect. The land is undulating and is cut by three small rivers, the Hodder, Cam, and Isis. Most of the country lies between 1500ft. and 3000ft. and only the faces of the Kaikoura Mountains at the back of the run ascend to higher altitudes; consequently there is very little snow risk.

The country would be classed broadly as mixed fescue tussock and silver tussock country and consists principally of Hurunui soil types.

When the present owner, Mr. I. H. Cameron, took over the property in 1933 he had plans for sowing cocksfoot to improve the native grassland. There had been successful establishment of cocksfoot on tussock country on Banks Peninsula and other areas and on his own run patches which had been sown some years previously were still thriving, and even on dry, wind-swept knobs plants survived in spite of heavy grazing by sheep and rabbits, all of which indicated that cocksfoot would establish.

It was realised that the successful establishment of any grass and more especially cocksfoot would involve spelling, and for the first few years old fences were removed to new sites and new ones erected to subdivide the run into blocks of convenient size. During this period small trials were sown with cocksfoot and protected by wire netting, and in swampy places and in stream beds seed was scattered among the rank vegetation. Cocksfoot established well and has since spread through the neighbouring swampy areas wherever moisture and tall vegetation have protected the seedling plants from grazing and aided establishment.

The success of these early trial sowings was encouraging, and having completed the necessary fencing, Mr. Cameron considered surface sowing. Seed had to be purchased because, although an area of some 30 to 40 acres had been ploughed and sown with cocksfoot with the aim of harvesting a seed crop, it was found that in most years seed would not fill because of summer droughts.

Method of Preparation for Sowing

Most of the effective rainfall occurs in early spring when frosts are still prevalent. When frosts have ceased hot winds dry out the country rapidly and the establishment of seedlings is unreliable. It was considered that by burning, the shading influence of the tussocks and tauhinu scrub would be removed, the ground surface would be opened to the sun, and the ground temperature would rise earlier in the spring so that seed could germinate and plants establish earlier and be able to utilise the available moisture before the dry conditions of summer.

The country was burnt in early August while the bases of the tussocks and dead matter surrounding them were wet. By waiting for suitable conditions it was found that the tops of tussocks could be burnt, leaving a

HEADING PHOTOGRAPH: View showing topography of the country sown. In the background is the inland Kaikoura Range.

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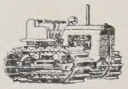

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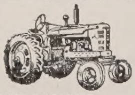

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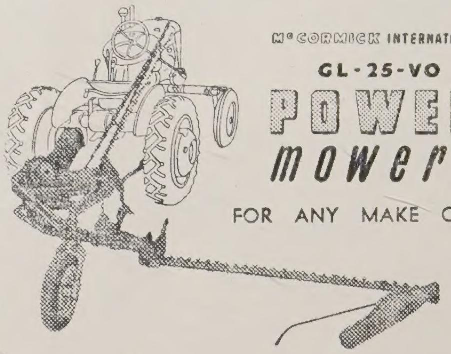

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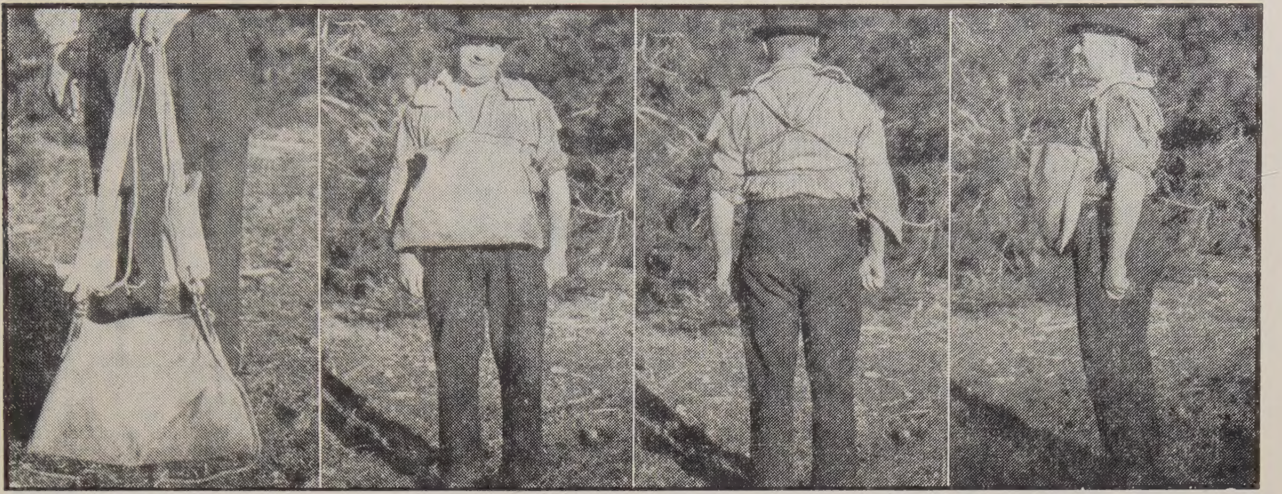

The type of sowing bag used, showing how it fits on the operator.

good crown. Sunny faces were burnt as soon as conditions would allow in early August, as it was realised that if burning there were delayed until drier conditions made a fire possible on the shady faces a month later, there would be danger of fires getting away on sunny faces when the vegetation was very dry and burning deeply into the crowns of tussocks, which might destroy them.

The condition favoured for burning is a light breeze so that the fire travels quickly and burns only the tops of the tussocks. Fires are usually lighted in mid- to late afternoon to get a quick burn and yet be stopped from undue spread by evening dews.

Method of Sowing

The first sowing on frost lift took place from September 10 to 29, 1943, on the first block of 400 acres. The seed was packed out in bags and placed at convenient intervals down spurs so that a man would have sufficient seed to last one or two trips before refilling his sowing bag. Sowing was done following the contours and from higher to lower altitudes, as a man tends to climb when sidling; but, having sown the area above, he is guided by the line of seed. To avoid misses, the downhill man of the team of sowers becomes the uphill man on the next trip, so that he can follow his own line. The most favourable areas, such as dark faces and gullies, were sown, but harsh, dry, sunny faces were passed over as establishment there seemed unlikely.

For sowing, bags were designed to give freedom of movement for the legs and to avoid chafing (see the photographs on this page). Bags hold about 25lb. and the weight is spread uniformly over the shoulders, which does not create undue fatigue.

The initial seed mixture used was:—

	lb. per acre
Perennial ryegrass	10
Cocksfoot	8
Crested dogstail	2
Subterranean clover	1
Total	21

After sowing, the block was spelled for a year. Shortly after it was sown a flock of sheep was driven through it en route to grazing at the back of the run. Some time later it was observed that where there had been trampling a much better establishment of young grass occurred, but at the end of a year's spelling the results, although encouraging, were not up to expectations, and no further spelling was allowed.

Surface sowing continued, however, and during the following 4 years 4 more blocks were sown. The experience gained in the initial sowings helped considerably in the successful establishment of sowings.

The broad details of the areas sown, seed mixtures and quantities sown, and results are given in the table below.

The seed mixtures were designed primarily for the establishment of cocksfoot. Perennial ryegrass, crested dogstail, browntop, danthonia, and clovers were included to fill in gaps while cocksfoot was being established. White clover and to a less extent red clover establishes well and appears to persist, whereas subterranean clover does not establish very well and has been deleted from later mixtures. Browntop does not appear to persist and was replaced by danthonia in the mixture.

Seed is expensive and, as the practice is costly, good-quality seed of high germination is used to ensure the best possible results.

DETAILS OF SURFACE SOWING OF TUSSOCK GRASSLANDS

Seed mixture	lb.	Area sown, sowing date, time of spelling, weather conditions during establishment, results.
Cocksfoot	8	400 acres; September 10-29, 1943; 12 months; hard winter and severe frost lift winter 1944; fair.
Per. ryegrass ..	10	
Crested dogstail ..	2	
Sub. clover	1	
Total	21	
Cocksfoot	8	500 acres; September 3-16, 1944; 2 years, stocked September, 1946; very favourable growing season; good.
Per. ryegrass ..	5	
Crested dogstail ..	2	
Browntop	2	
Total	17	
(As above)		450 acres; August 18-28, 1945; 12 months, stocked September-November, 1946, and spelled until May, 1947; winter after sowing mild with little frost lift; good in swamps, but poorer on hills.
Cocksfoot	4	200 acres; early August, 1946; 20 months, August, 1946, to May, 1948; average season, exceptionally mild winter; very good establishment, more especially on dark and shady faces.
Per. ryegrass ..	3	
Crested dogstail ..	2	
White clover	1½	
Red clover	½	
Total	11	
Cocksfoot	4	1300 acres, 1000 acres; end of August to mid-October, 1947; September, 1947, to March, 1949; mild winter—little frost lift; the area sown and tramped in late August, 1949, was excellent, but that sown and tramped later was fair—where sheep gained access establishment was poor.
Per. ryegrass ..	3	
Crested dogstail ..	2	
Danthonia	1	
White clover	1½	
Red clover	½	
Total	12	

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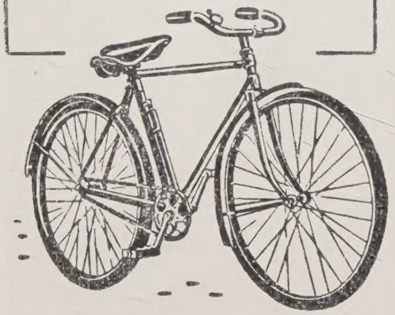

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Largest Block

The most recently sown block was of about 1300 acres, of which approximately 1000 acres were sown with the following mixture:—

	lb.
Cocksfoot	4
Perennial ryegrass	3
Crested dogstail	2
Danthonia	1
White clover	1½
Red clover	½
Total	12

This block was the largest yet attempted and burning was carried out ahead of sowing. Because of wet weather, sowing extended over 2 months from the end of August to mid-October, 1947. The first portion was sown and tramped in August, but the remainder of the block was sown in early to mid-October. Trampling with sheep could not be carried out very effectively, as cocksfoot from the earlier sowing had germinated and stocking may have been injurious to seedlings.

Unfortunately in the following early winter some neighbouring sheep gained access to the sown area and destroyed cocksfoot seedlings on the lower portion of the block, but other areas of the same block where these sheep had not grazed showed a good strike and growth of seedlings.

A most interesting feature was an area of about half an acre of cocksfoot. This patch was dense and had established on a dark face down wind from a swampy place which had been sown as an experiment 9 to 10 years previously. The spelling of the block from September, 1947, to March, 1949, in conjunction with the sowing programme had resulted in reseeding from these established plants and indicated the result which the sowing programme could achieve eventually.

It must be emphasised that although the programme has been in progress for 5 years, the owner is still learning. For instance he suggests that by burning the previous year, together with light stocking, the top growth of tussocks and tauhinu and manuka scrub can be reduced and yet danthonia and Yorkshire fog can be controlled from making a very vigorous growth. The growth of tussocks from one year will give added protection for seedlings, yet will not be sufficient to shade the ground and prevent the warming influence of the sun to promote early germination. Also, burning the previous year allows sowing at the desired time in August. It is often necessary to wait for suitable conditions for burning and this time lag retards the time of sowing until later in the spring, when it may be too late to gain the full effects of the spring rains and a poor establishment will result.

Stream bed where cocksfoot has become well established and is seeding among tall vegetation; these centres of seeding assist establishmnt along the banks.

Where it is proposed to sow a block, the owner believes that the best procedure is to allow the block to become dirty with a rank growth of tussock and scrub before burning it. The accumulation of leaf mould and dead matter which is left after the fire provides a favourable seed-bed and protection for seedlings.

Early sowing in August or even late July, while there is plenty of frost lift, allows the seed to become well buried, which is essential for good germination and establishment. Seedling plants become firmly rooted in the spring and can withstand the dry summer conditions better. If there is little frost lift during and after sowing, the seed remains on the surface, where it may germinate, but as the soil is light and friable and the plants are not strongly rooted, they may succumb with the onset of dry summer conditions or be lifted out by frost during the following winter.

Importance of After-treatment

Trampling with stock immediately after sowing is the most important item in the programme, for, besides burying the seed and consolidating soil particles lifted by frost, sheep moving over the area scatter dead matter and litter to afford protection for the seedling plants.

It is also very necessary to spell the block for at least a year or preferably for 18 months to allow the seedling plants to become firmly established and to form a dense crown. The last block sown illustrates this point well. Neighbouring sheep gained access through pig holes in the boundary fence and grazed the lower part of the block in the early part of winter after sowing and little establishment has occurred. In the upper portion of the block, where sheep did not cross the creek for grazing, early sowing, together with trampling and spelling,

Left—Nature of the blocks before burning; note the prevalence of tauhinu scrub. Right—View of the 1300-acre block. In the left foreground sheep gained access and grazed the slopes. The sunny spurs were passed over and only the shady and dark faces were sown.

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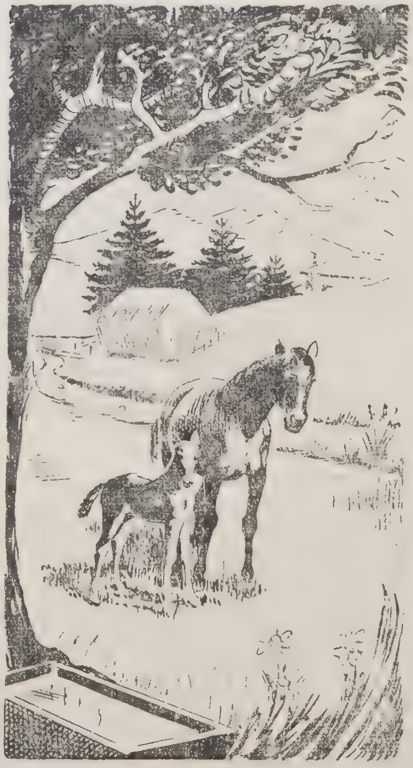

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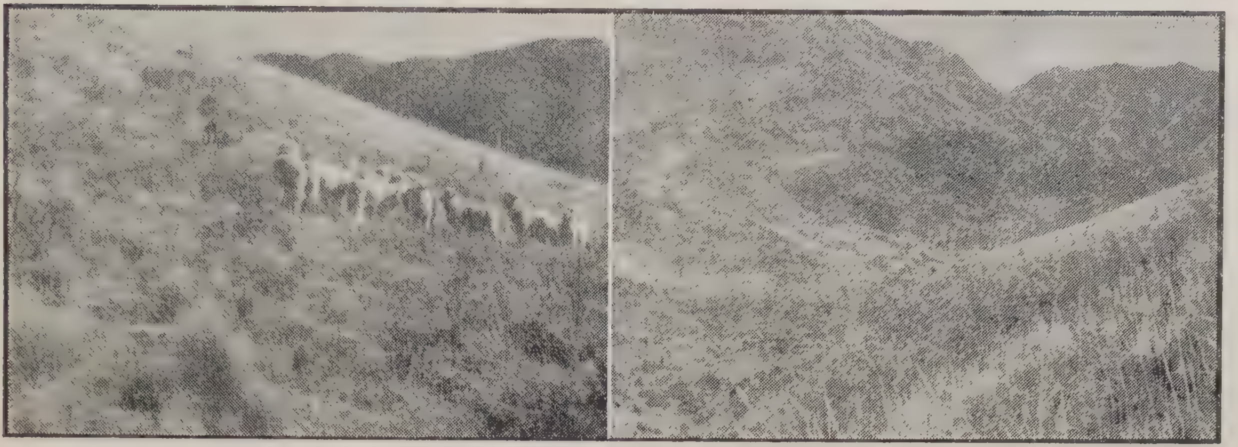


Left—Type of stock grazed. Note the abundance of danthonia in the foreground. Right—The upper reaches of the valley shown at left. The effects of burning in clearing the country preparatory to sowing can be seen in the right foreground; in the background are unburnt faces.

has given excellent results. Also, this part of the block had more dark faces and was more sheltered from drying winds than the lower part, but, when everything is considered, this block illustrates well the best method of sowing at present known to the owner and also the folly of sowing without sufficient trampling and of stocking before plants are properly established.

Stock

When the property was occupied by the present owner in 1933 the flock consisted of Merinos, and the fences were in disrepair, which allowed sheep to crowd on to the ewe country. Furthermore, the country was very dirty with tauhinu scrub and rabbits were plentiful. As a result of these conditions lambings were poor and it was considered that a change-over to half-breds would provide saleable surplus stock as improvements were effected. Lincoln-Merino first cross rams were mated to the ewes, with better results, but still lambings were not much improved. However, with good fences, clean country, and surface sowing with cocksfoot, it was possible to flush ewes for mating and lambings and wool weights improved. Today the flock may be classed as fine half-bred and a surplus of some 600 to 700 sheep is sold annually.

The following table indicates the stock improvement:—

	1944-46	1948-49
Lambing ..	44-46 per cent.	77 per cent.
Wool weight	7½lb.	8½-9lb.
Deaths ..	8-10 per cent.	3 per cent.

In blocks sown with cocksfoot lambings of 85 to 90 per cent. were obtained during the 1948-49 season (these figures are based on lambs tailed to ewes mustered).

During the period of occupation vermin have been reduced considerably, as is shown by the following table:—

	1936	1941	1945-46	1948
Goats ..	800	450*	1,500*	250
Wild sheep	600	200-300*	500*	150
Pigs ..	N.A.	N.A.	220*	50
Rabbits ..	N.A.	N.A.	7,500	N.A.

N.A. not available. *Government culled.

On the basis that 6 rabbits graze as much as 1 sheep, and that 1 goat and 1 wild sheep each graze as much as 1 sheep, the above table expressed in terms of approximate sheep equivalents is shown below:—

1936	1941	1945-46	1948
1,400	700	3,250	400

The above figures show the extent to which vermin in terms of sheep have been reduced. Before 1945 the property was carrying 3500 to 4000 sheep, together with vermin, which was equivalent to approximately 7000 sheep. Today it carries approximately 4000 sheep, and vermin are negligible. This destruction of vermin, which is equivalent to a reduction in the number of stock carried, allows spelling, which is so essential to surface sowing, and makes it possible to "do" stock better and improve the country.

Marked Improvement

The improvements which have accrued through fencing, surface sowing, and spelling, together with the control of vermin, are marked. Both the stock and grassland are being improved. With fencing and vermin control the grassland can be spelled for periods to allow cocksfoot to establish. On this ewes can be flushed for mating, lambing percentages increase, and the average wool weight increases. Furthermore, the death-rate has been reduced, which, together with improved lambings, provides a surplus of stock for sale, which augments the income. By providing an alternative source of revenue this surplus in some small measure helps to offset the vagaries of wool prices on which most high-country properties depend for their income.

To what extent stock improvements can be attributed to either surface sowing or reduced stocking by the destruction of vermin is difficult to assess. However, from the records being kept by the owner the difference between the lambings of flushed and unflushed ewes on sown and unsown blocks is 20 per cent. in favour of flushed ewes.

It is intended to sow 2 further small blocks of 500 and 200 acres, followed by others of 1500 to 3000 acres, and lastly a 10,000-acre block. A similar method of sowing to that outlined will be carried out on the small blocks, but with the big blocks, owing to the large quantities of seed required, it is intended to sow the swamps and stream beds first. It will not be necessary to spell in these circumstances and only when the first-sown areas are well established and tending to spread, will attempts be made to sow the whole block.

It is expected that aerial sowing will be of advantage in sowing the larger areas.

Conclusions

1. It is stressed that these improvements have been effected on mixed silver and fescue tussock grassland on a Hurunui soil type and on rolling to hilly country where there is little snow risk.

2. Cocksfoot has been successfully established on 5 blocks covering 1800 acres on the lower, more easily accessible parts of the run.

3. Successful establishment depends on fencing, burning, trampling, and spelling.

4. After-treatment of trampling with stock to consolidate the ground and bury the seed immediately after sowing is important for good germination.

5. Spelling for 18 months is necessary to ensure firm establishment of plants.

6. Control of vermin is essential.

7. The combined effect of surface sowing, spelling, and reduction of vermin has been improved lambings, increased wool weights, and reduced deaths.

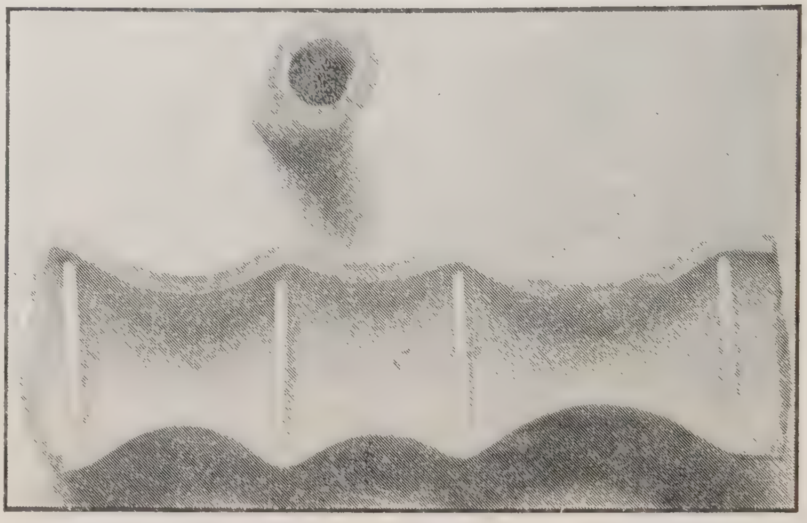
8. There are other areas of tussock grassland with a similar type of soil and climate where cocksfoot would thrive, and this account is given for the benefit of other runholders who are contemplating surface sowing.

References

"Soil Erosion in the High Country of the South Island", Department of Scientific and Industrial Research Bulletin No. 92 (1945).

Caustic Soda the Best Cleaning Agent for Milking Rubber

THE need for conserving milking-machine rubberware is perhaps not as great now as during the war, when the raw material was practically unprocurable and rubberware of any kind was very scarce. Rubber through which milk flows or with which it comes in contact must still be kept clean, however; as maintenance of cleanliness is essential to rubber conservation, these two desirable objectives are complementary. Results of trials to determine the effects on milking rubberware of four different methods of cleaning are detailed in this article by J. M. Kristensen, Special Inspector, Department of Agriculture, New Plymouth.



[*Douglas Elliott photo.*

A section of long milking rubber after being used for 3 years, during which time it was cleaned by the boiling water-caustic soda method.

RUBBER of high quality is the best and cheapest to use. The enemy of rubber is oil, grease, or any other fatty substance, so it is imperative that the outsides of machine rubbers be washed thoroughly immediately after milking has been completed.

Many farmers discard inflations very frequently with the aim of maintaining uniform milking; this procedure could be modified, and if inflations were properly looked after, their life would be longer. Rubberware can best be conserved by the regular use of a detergent and a method of cleaning which effectively removes fat, and unless such a method is used fat quickly penetrates into the pores of the rubber and destroys the inside surface. The most satisfactory cleaner for the purpose is caustic soda, and the methods recommended were described fully in an article by W. G. Batt in "The Journal of Agriculture" for November, 1949.

The use of caustic soda rather than other cleaners has been the subject of a great deal of controversy among farmers, some arguing that caustic soda tends to cause milkstone to collect more readily on metal parts as well as on the inside of rubberware of milking machines. That is not so, as it has been found that use of washing soda and cleaners other than caustic soda often causes greater accumulation of milkstone and results in poorer cleaning of rubberware than if caustic soda had been used.

Inflations, which are constantly flexed while the machines are in use, must be kept at a uniform tension for efficient milking, so fat impregnation must be prevented as far as possible. Fat penetrates most readily at the point of contact with the teat, and the bulging at this point is caused by the rubber becoming fat saturated. That is proved by the fact that when such fat is extracted the inflation returns to its normal size and shape, as is shown by the results given in the lower table on the next page.

Four Methods Tried

Results of trials carried out to ascertain the effect on the rubberware of different cleaning methods are very illuminating. Complete sets of new, grey, soft inflations were fitted to a milking machine which has 4 sets of teat-cups, and to identify the inflations they were marked in large letters with ink pencil before being fitted into the cups. Those for the first set of cups were lettered 1A, 1B, 1C, and 1D, for the second 2A, 2B, and so on. Each set of cups was cleaned in a different way and with a different solution.

Group 1 was cleaned as recommended by the Dairy Division; that is, by a liberal flushing through the cups of cold water, followed by at least 1 gallon of boiling water containing caustic soda at the rate of 1 heaped teaspoonful per 4 gallons, and finally another gallon of boiling water. This treatment was carried out twice daily after milking.

Group 2 was treated similarly to Group 1 in the morning, but in the evening the caustic soda was omitted, the flushing being done only with cold water followed by boiling water.

Group 3 was cleaned in the morning with caustic soda similarly to Groups 1 and 2, but in the evenings the solution which followed flushing with cold water consisted of 1 gallon of boiling water in which was dissolved about ¼ handful of washing soda. The final flushing was with another gallon of boiling water.

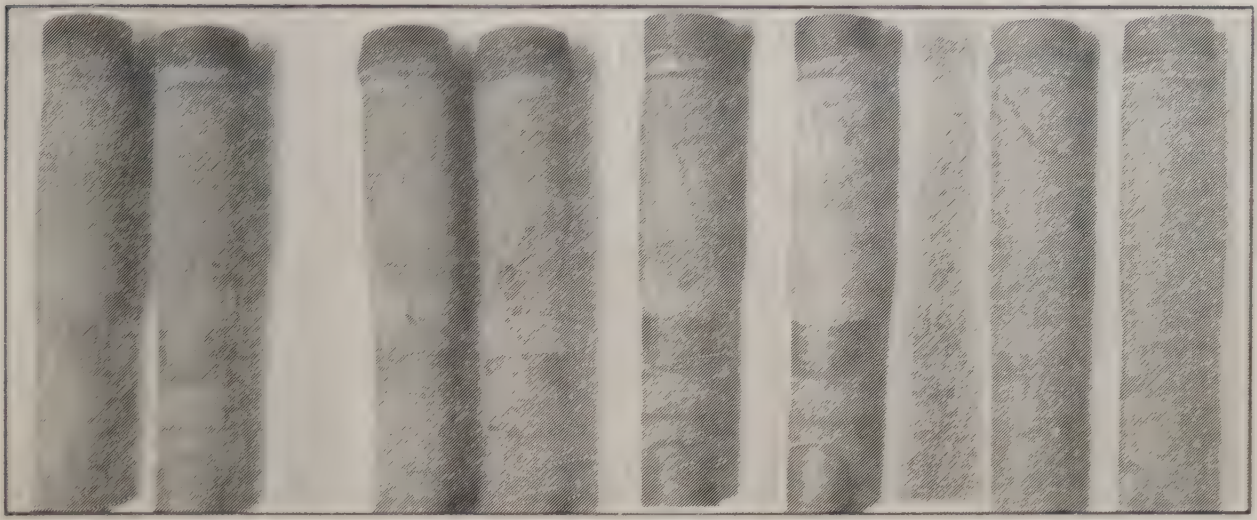
Group 4 was cleaned both morning and evening with a washing soda solution as used in the evenings for Group 3, the routine being cold-water rinse, then washing soda and boiling water, and finally boiling-water rinse.

These cleaning methods were applied to the machine for nearly 4 months—from August 2 until November 20—during which time the herd consisted of 35 cows. The inflations were then removed from the teat-cups, dried, and weighed carefully. They were measured for length and for circumference of the bulged portions which had developed where the inflations squeezed the cow's teats. The inflations were then kept as hot as possible (about 200 degrees F.) for 3½ hours in a strong solution of caustic soda—4 teaspoons in 2 quarts of water—according to the method recommended by G. M. Moir in the "Journal" for September, 1943. This method of extracting fat from the inflations is several thousand times as intense as the usual daily cleaning procedure, because the caustic solution is very much stronger and is applied for hours instead of for about a minute. After removal from this strong solution the inflations were rinsed thoroughly with very hot water to wash off the butterfat soap which was produced. They were then allowed to dry before the final weighing and measuring.

Results of Trials

The results given in the upper table on page 301 show that less fat was extracted from the Group 1 inflations than from any of the others, the average from Group 2 was a little higher than from Group 3, and Group 4 yielded most of all; in fact, the use of washing soda twice daily instead of caustic soda allowed the inflations to absorb twice as much fat. Washing soda is nearly two-thirds water, and even when a liberal amount is used it does not provide a strong enough cleaner.

The results show that cleaning with caustic soda twice daily, as applied to Group 1, was much the most efficient way to check the absorption of fat left on the surface of the rubber after milking.



Left—Soft inflations before being treated by soaking in a 5 per cent. caustic soda solution. The bulges were caused by absorption of fat. Right—The same inflations after treatment. The removal of fat has also removed most of the bulge.

Group	Weight in grammes Before treatment	 After treatment	Reduction by fat extraction
1A	41.03	39.30	1.73
1B	41.05	39.50	1.55
1C	41.45	39.70	1.75
1D	42.20	40.80	1.40
		Average	1.61
2A	41.70	39.00	2.70
2B	41.55	38.91	2.64
2C	42.38	39.93	2.45
2D	41.80	39.33	2.47
		Average	2.57
3A	41.35	39.04	2.31
3B	41.47	39.00	2.47
3C	41.35	39.02	2.33
3D	41.00	39.00	2.00
		Average	2.28
4A	42.20	39.03	3.17
4B	42.09	39.07	3.02
4C	42.12	39.06	3.06
4D	42.18	39.04	3.14
		Average	3.10

The strong caustic treatment, as well as extracting fat, also reduced the sizes of the inflations. Results for Group 1 in the table below show the superiority of caustic soda cleaning over other methods for conserving rubberware and giving better and quicker milking. The results prove that absorption of fat is the cause of inflations increasing in length and circumference so that they become slack and milk less quickly and efficiently.

Caustic Soda Method Proved Best

More than 30 years of experience has shown that the best way to keep the inflations and other parts of a milking machine in good hygienic condition is to apply twice daily the caustic soda-boiling water method recommended by the Dairy Division. The conclusion to be drawn from the trial described is that this method also ensures that the inflations are maintained in the best possible condition to give long and efficient use.

The inflations used were all new and the trial was carried out on the property of an efficient and reliable farmer who agreed to bear with the inconvenience caused by the use of four different cleaning methods.

Many different kinds of detergents have been manufactured and marketed, but experience under all conditions has shown that caustic soda used properly is the best cleaner because its regular use with boiling water removes nearly all trace of fat.

Three good reasons why milking-machine rubberware should be conserved are that a perished surface in rubber harbours bacteria and provides intense contamination, that such a condition may assist the spread of mastitis, and that inflation rubbers give quicker milking if they retain their tension.

Group	Length of inflation (inches) Before treatment	 After treatment	 Reduction	Circumference at point of bulging (inches) Before treatment	 After treatment	 Reduction
1A	6 12/16	6 11/16	1/16	3 14/16	3 12/16	2/16
1B	6 12/16	6 11/16	1/16	3 14/16	3 12/16	2/16
1C	6 13/16	6 12/16	1/16	3 14/16	3 11/16	3/16
1D	6 12/16	6 10/16	2/16	3 15/16	3 12/16	3/16
2A	6 13/16	6 11/16	2/16	4 3/16	3 14/16	5/16
2B	6 12/16	6 10/16	2/16	4 4/16	3 14/16	6/16
2C	6 12/16	6 10/16	2/16	4 3/16	3 15/16	4/16
2D	6 13/16	6 11/16	2/16	4 4/16	3 15/16	5/16
3A	6 14/16	6 12/16	2/16	4 1/16	3 13/16	4/16
3B	6 14/16	6 11/16	3/16	4	3 13/16	3/16
3C	6 13/16	6 11/16	2/16	4 1/16	3 14/16	3/16
3D	6 14/16	6 12/16	2/16	4 1/16	3 13/16	4/16
4A	7 1/16	6 14/16	3/16	4 3/16	3 15/16	4/16
4B	6 14/16	6 11/16	3/16	4 2/16	3 15/16	3/16
4C	6 15/16	6 11/16	4/16	4 3/16	3 15/16	4/16
4D	7	6 12/16	4/16	4 4/16	4	4/16

BOOK REVIEW

"The Draining of Farm Lands": A. W. Hudson and H. E. Hopewell

THE authors of "The Draining of Farm Lands," A. W. Hudson, Head of the Soils and Husbandry Department, and H. E. Hopewell, Lecturer in Soils, Massey Agricultural College, have prepared a very complete text on the principles and practice of thorough land drainage. Of particular importance are the sections dealing with surveying and levelling, mole ploughs, and ditching and tile-laying machinery.

The use of machinery should now replace hand work in thorough land drainage on farms, and machines can function properly only on the basis of carefully predetermined grades. This book gives a thoroughly practical approach to the work of planning drainage systems, taking levels, laying tile drains, and drawing mole drains. It should be of great value to farmers, agricultural contractors, and farm extension workers.

—P.W.S.

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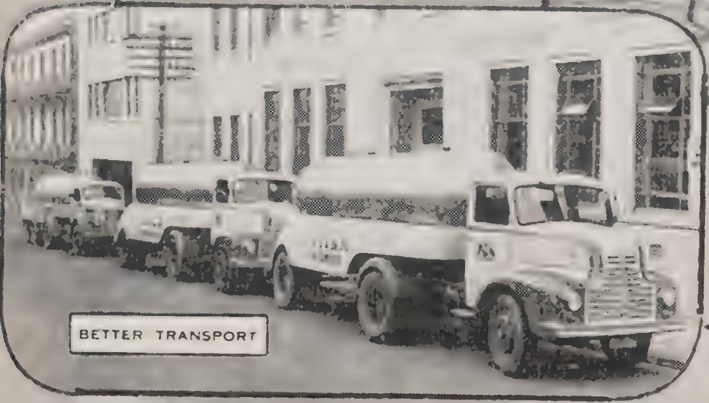

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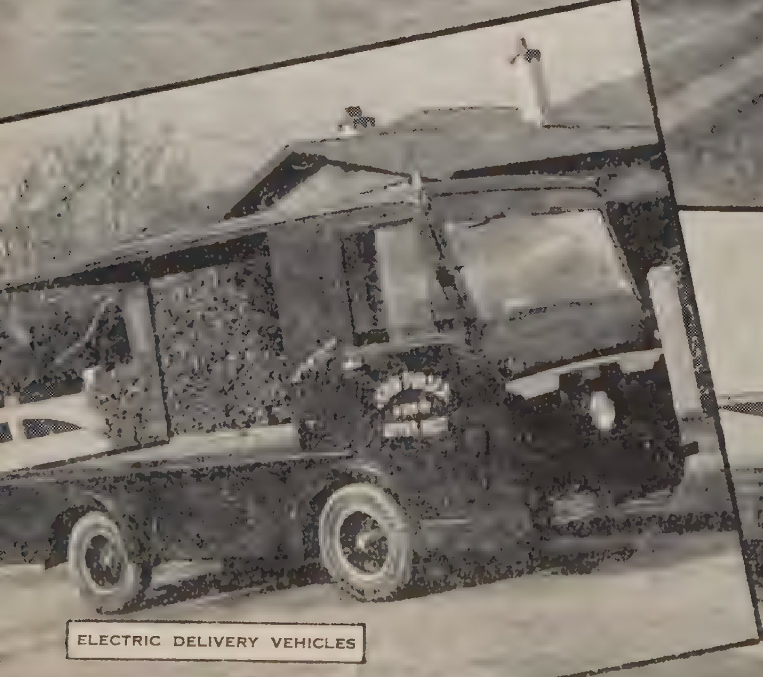

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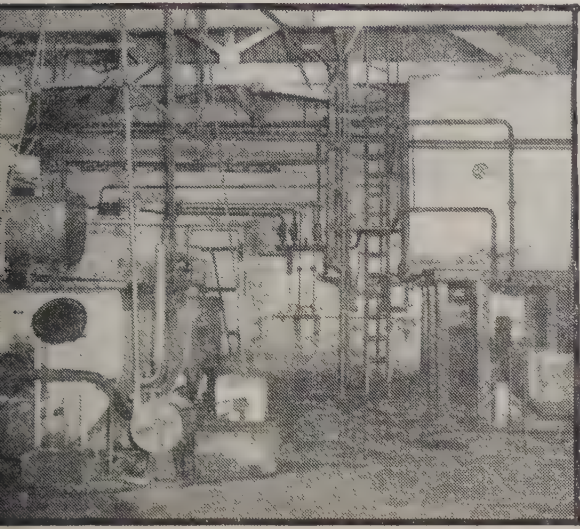
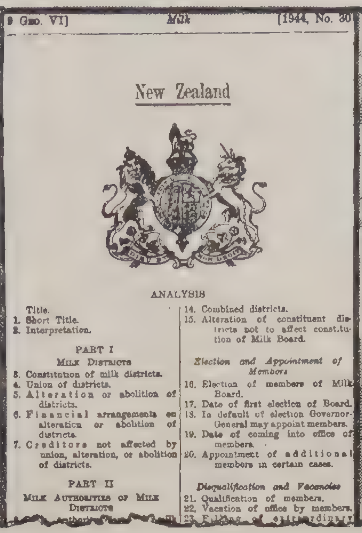
The Progress of the Town-milk Industry





9 Geo. VI] Milk [1944, No. 30

New Zealand

ANALYSIS

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IN no other foodstuff lies a greater potential for injury to public health than in milk, so that any improvements in the town-milk industry are indirectly improvements in the health of the people. This fact is confirmed by the degree to which most countries exercise supervision over the industry. In New Zealand the industry is rapidly realising the aims envisaged for it by the Milk Commission in 1943 and more clearly defined in the Milk Act of 1944. This article by T. P. J. Twomey, Superintendent of Market Milk, Department of Agriculture, Wellington, traces the progress of recent years.

THE town-milk industry is composed of three fairly clearly defined sections, production, treatment, and distribution, all of which seek to serve the interests of the housewife. For any one section of the industry to progress independently of the others would be manifestly unbusinesslike, and one of the most pleasing features of progress to date in New Zealand is the way in which the industry as a whole has advanced, each section playing its full and expected part. Though the Milk Commission in 1943 was obliged to confine its investigations to the town-milk industry in the four major cities, anybody reading the commission's report would soon draw the conclusion that conditions outside these four areas were no less open to criticism.

Major Weaknesses

Many factors had combined to bring about the state of affairs which led to the sitting of the Milk Commission. One set of factors was primarily internal; that is, it affected the people in the industry; the other set was largely external in that it affected the consuming public rather than the industry itself.

The principal internal weaknesses were lack of stability; undercutting and unfair competition; and lack of a clearly defined policy for the future of the industry.

The major external weaknesses affecting the customer were periodic shortages; varying quality; erratic treatment standards; and varying price.

As the result of the Milk Commission's findings a general reorganisation of the town-milk industry was planned. To bring this about the Milk Act of 1944 was passed and the Marketing Department (then the Milk Marketing Division) was charged with the duty of implementing the Government's plans for agreeing on a guaranteed price with the farmer; arranging with the trade guaranteed margins for such services as milk collection, treatment, and delivery; and initiating improvements in existing milk-treating stations. The major improvements resulting from that planning are reviewed in this article.

Production

The problem of recurring shortages and flushes was attacked by ensuring a guaranteed price to the town-milk producer. As first negotiated this price took into account the higher cost of non-seasonal production and was fixed at a figure suitably in excess of the guaranteed price payable to suppliers of milk and cream to dairy factories. This price was later negotiated on a different basis, but the intention to pay the town-milk producer a higher reward for his more onerous responsibility has been maintained.

In exchange for this guarantee of a satisfactory price, town-milk producers were obliged to form themselves into local co-operative milk-supply companies or associations. Each supply association undertook to guarantee a fixed quantity of milk daily to the consumers in its area. This quota is re-assessed yearly.

The quota is guaranteed by the producers acting as a company or association, but individual producers agree on their own daily quotas with the supply company of which they are members. As town-milk producers know from experience the difficulties involved in guaranteeing a fixed daily quantity of milk, special provision is made for the payment of the guaranteed price for a certain surplus over the nominated quantity. In general, the guaranteed price is paid for the nominated quantity plus 17 per cent. surplus in summer and plus 10 per cent. surplus in winter.

The payment of a guaranteed price for a guaranteed quantity has largely removed the fear of winter shortages of town milk, and most supply companies now have waiting lists of dairy farmers anxious to produce milk for town supply. The guarantee of a minimum quota has had the added advantage to the consumer of tending to avoid the necessity for winter milk supplies being drawn from predominantly seasonal producers.

Treatment

When the Milk Commission sat in 1943 the standard of many milk-treatment stations in New Zealand was regrettably low, the position being aggravated by wartime conditions. On the other hand, a few stations were of a high standard and were being operated with praiseworthy technical competence; the municipally-owned Wellington depot was an example.

The effecting of substantial improvement in the average milk-treatment station presented many problems, not least being the very high cost of milk plant and other equipment in the immediate post-war years. This fact was recognised by many of

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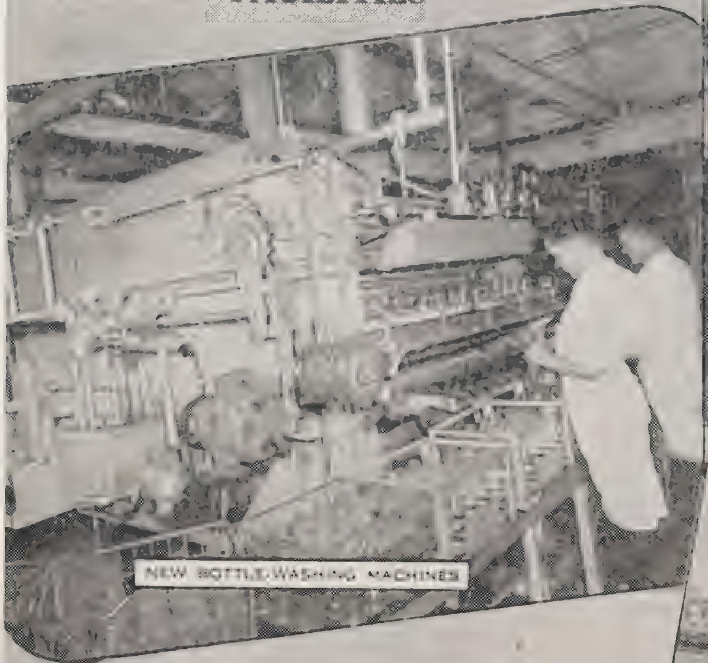
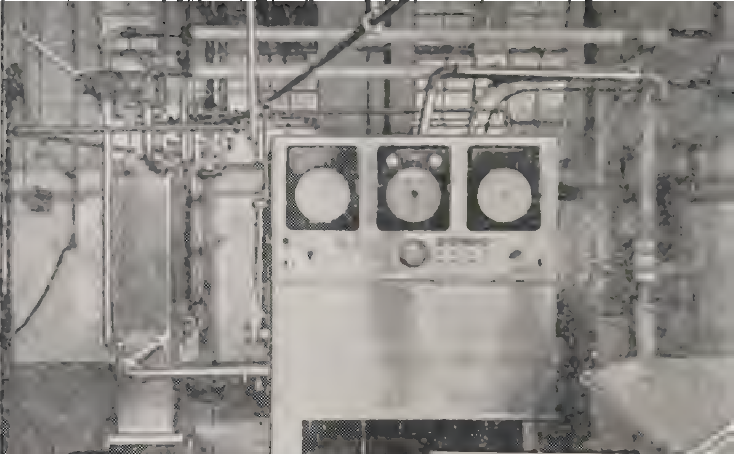
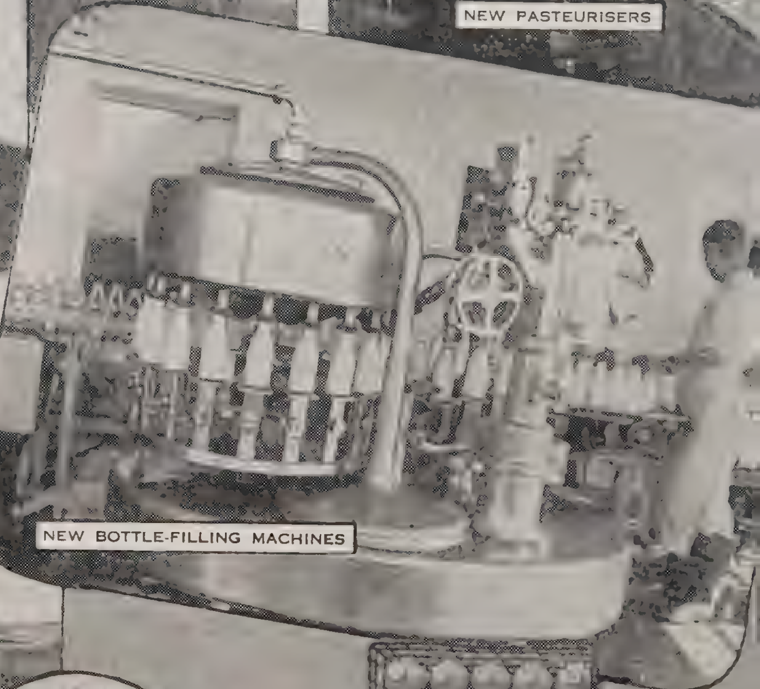
Upper left photograph on opposite page by "Evening Post"; middle left by Jack Welsh and Sons; lower right by Sparrow Industrial Pictures Ltd. Photograph at left above by Jack Welsh and Sons.

PROGRESS IN MILK-TREATMENT FACILITIES

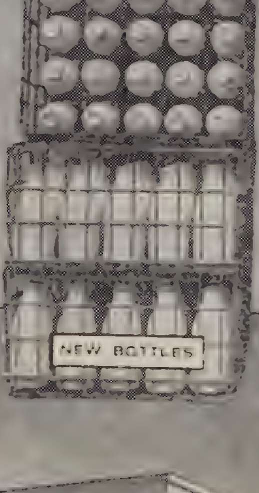

NEW BOTTLE-WASHING MACHINES

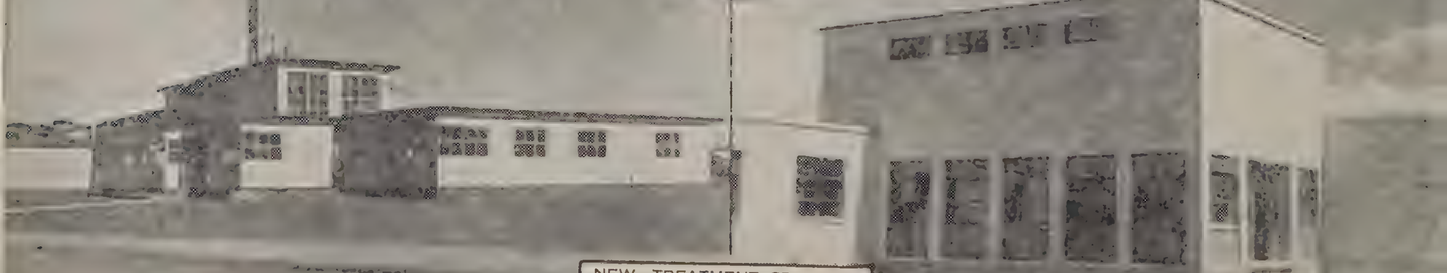

NEW PASTEURISERS


NEW BOTTLE-FILLING MACHINES

MAJOR REMODELLING OF STATIONS

TEMPORARY EXTENSIONS


NEW BOTTLES


NEW TREATMENT STATIONS
(DUNEDIN) (HASTINGS)

the owners, and when the Milk Marketing Division was authorised to buy these stations and re-equip them under Government auspices they were readily offered for sale. Once the stations had been acquired by the Government steps were taken either to re-equip them or, in certain cases, to build new stations. Such action was fraught with political implications, and progress in this direction was not as rapid as could be desired. Nevertheless, substantial progress was made, particularly in areas where progress was essential to safeguard health. Parallel with Government action in this direction, several owners of milk-treatment stations who did not wish to sell their depots extended and re-equipped them as necessary.

> **As a result of all this, milk-treatment facilities of nearly all the stations in the country have now been brought up to a high standard. Several have been or are being entirely rebuilt, and in other cases modern equipment has been installed. Full credit is due to those private owners who have undertaken this necessary but expensive action in an endeavour to fulfil their responsibilities as well as possible.**

The stations which came under Government ownership included some where only rebuilding or major alterations could be considered the proper action. As a result, new stations have been erected in Dunedin and Hastings, a new one is being built in Auckland, and major alterations have been effected in Palmerston North and Wanganui. Certain stations have been acquired by the Government and transferred to municipal or local public ownership, and major improvements have followed this change of ownership. The station in Whangarei is now municipally owned and that in Wanganui publicly owned; the largest station in Christchurch is semi-publicly owned.

Of the technical advances made in milk treatment during the past few years, the three most obvious have been improved pasteurisation techniques, aluminium capping of bottles, and daily milk testing. Modern pasteurisers of the type recently installed in milk-treatment stations perform miracles of efficiency and hygiene, and they have left far behind them any suggestion that hit-or-miss methods would suffice in the important operation they perform. Aluminium capping—that is, the use of a metal cap which fits right over the top of the milk bottle—has now been introduced in Whangarei, Auckland, Hamilton, Hastings, Palmerston North, the Hutt Valley, and Nelson. Regular milk testing, long considered the preserve of the large treatment station, has now been extended to all the stations in the country, and the benefits to producers and consumers have been gratifyingly evident.

The remuneration which can be earned by a treatment station is small in relation to the capital investment. Whatever the rights and wrongs of public ownership, this fact must influence rebuilding and re-equipment. Undoubtedly the extent to which rebuilding and re-equipping have been carried out would not have been achieved easily had some of the stations not come under public ownership.

Criticisms of the principle of improving milk-treatment facilities are sometimes aired by people who would be the first to express horror at any attempt to prevent improvements in town water supplies. Admittedly milk-treatment plant is expensive, but so is the plant necessary to provide a safe reticulated water supply. Yet poor milk-treatment facilities can be as dangerous to the health of a people as a poor water supply. Any country that now wishes to call itself both civilised and progressive is committed to a policy of safeguarding its milk supply, and these safeguards must be applied not only at the point of production but at every stage through which the milk passes on its way to the consumer. Improving the health of the cow and guaranteeing the cash reward of the producer are not in themselves sufficient; treatment facilities must also be adequate even though these, too, are unavoidably expensive.

Distribution

Though less spectacular than that in the fields of production and treatment, the progress made in the distribution of milk to the consumer has been steady. As with the guaranteed price to the producer, venders' interests were safeguarded by the establishment of a guaranteed margin in exchange for their services as distributors. The margin established was 9½d. a gallon and, judging by the waiting lists of people anxious to buy milk rounds, that margin has been highly successful in ensuring an adequate return to those in the distributive side of the industry.

One of the weaknesses of the old set-up was that the milk-delivery business was highly competitive. That was praiseworthy as long as the venders were selling different milks, but with the growth of milk-treatment stations a position developed in which venders, though operating competitively, were all selling an identical product. Competition under such conditions offered no benefit to consumers and served only to keep the cost of delivery unnecessarily high. It soon became obvious that the costs of distribution could be reduced only by obviating useless competition and, in line with wartime practice and the recommendations of the Milk Act zoning was either continued or extended on a wide scale. Systems of zoning varied between towns, but in general the practice was to limit the overlapping of milk deliveries by adopting the principle of one vender to one zone.

The zoning of milk rounds ensured the cessation of expensive competition and guaranteed the vender's livelihood to him. The interests of the consumer were safeguarded through the provisions of the Milk Act, which required that the operation of zoning be the responsibility of local milk authorities appointed under the Act. This meant that zoning followed the formation of these authorities (usually called milk boards or borough council milk committees), the members or secretaries of the authorities presenting a focal point to which complaints of unsatisfactory milk deliveries could be directed. This system has worked well. Incidentally, though New Zealand consumers are accustomed to having their milk delivered to their homes, they would not find that the same necessarily applied if they lived in America or Europe, where a higher price is charged for home-delivered milk.

Apart from zoning, the distributive side of the industry has progressed in two other ways—the provision of covers on venders' vehicles and the introduction of electric delivery vans. Sunlight and milk do not agree and the use of fixed covers on delivery vehicles is essential. Venders with an appreciation of the importance of the service they give have readily accepted this principle and in several cities in New Zealand—notably Hamilton, Nelson, Timaru, and Dunedin—covered vans are now standard. Other areas are following this example.

Electric vehicles are a fairly new departure for New Zealand's milk venders. An electric truck is driven by a motor powered by a large storage battery instead of a petrol engine, and as they are silent in operation and cannot be driven at an excessive speed they are well suited to early-morning milk deliveries. Such vehicles, though dear in first cost, are remarkably cheap in operation. So far there are few on the road in this country, but judging by experience overseas they are likely to increase rapidly in popularity.

Control

The efficiency of control methods has increased in line with the progress made in the other phases of the town-milk industry. Control has always been exercised by the Departments of Health and Agriculture, but the Milk Act, by sponsoring the formation of milk boards or milk authorities, increased the opportunities for a more local interest in the operation of these control measures.

The Milk Commission recommended the formation of a central guiding authority for the town-milk industry, and this authority subsequently came into being as the Central Milk Council. This council was expected to direct the progress of the industry and was given wide powers under the provisions of the Milk Act. The formation of such an authority was recommended by a royal commission set up to study the milk business in England 3 years ago. In practice, the Central Milk Council assists local milk boards in their work of control at local levels.

The Department of Agriculture, through its Livestock Division officers on the production side and through its Dairy Division officers on the treatment side, continues the functions of supervision and control on a national level. The degree of supervision being given to these two aspects of the industry has been reflected in a steady improvement in standards.

The Department of Health exercises supervision over all aspects of milk distribution, whether retail or through dairy shops, and officers of that Department work closely with officers of the Department of Agriculture in ensuring that supervision all through the industry is co-ordinated effectively

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Lower right photograph on opposite page by R. W. Orr.

to the advantage of the consumer. Representatives of both Departments attend meetings of milk authorities and give expert technical advice.

What Remains to be Done

Progress in all phases of the town-milk industry in New Zealand has been rapid during the past few years and betokens a sound good will on the part of all those engaged in it. Nevertheless, complacency cannot yet be justified, as much remains to be done.

Town milk is still bought on a gallonage basis and no extra reward is paid to the farmer who produces a higher-quality milk than does his neighbour. Payment for quality has still to come.

Certain towns have milk-treatment stations which should be replaced by new ones. To name these towns (there are only three or four) would be invidious, but if the consumers in these areas could realise the costly difficulties under which these stations have to operate, they would soon request that remedial action be taken. The treatment of milk is too important to justify chances being taken with old buildings and out-of-date plant.

In New Zealand about 85 per cent. of all the town milk sold in urban areas is pasteurised. This figure has been rising steadily and further progress can be expected. There is still a danger where dairy shops buy raw milk for use in milk shakes. This raises a problem for mothers who insist on their children having pasteurised milk at home (school milk, of course, is pasteurised). Such mothers should allow their children to patronise only dairy shops which handle pasteurised milk exclusively. All milk sold to shops and milk bars in the larger urban areas should be pasteurised.

Too much "billy" milk is still sold. Hygiene demands that milk should be untouched by hand, and that demand can be met only by the sale of milk in sealed containers. Milk sold in bottles is now a high proportion of the whole, but the position will not be satisfactory until all milk sold to homes is delivered in bottles filled and sealed under laboratory control.

All vehicles used for the conveyance of town milk should have fixed covers to protect the milk from the effects of the sun. Good progress has been made, but many vehicles are still lacking in this respect.

Certain local milk authorities deserve congratulation for their part in ensuring fair play and proper supervision over all sections of the town-milk industry in their areas. Unfortunately, a few districts cannot boast that their milk authorities come within this category. A milk authority is not an imposition from above, but is a safeguard not only to the consumer but also to every section of the industry. Milk authorities are not something new and untried, for equivalent organisations have been operating in other countries for many years.

The past is creditable and the future is bright. The industry is stable, there is no milk shortage, the standard of treatment has risen appreciably, and control and supervision are being carried out on properly co-ordinated lines on both local and national levels.

Show Dates

THE following are dates and venues of A. and P. shows up to mid-January.

*November 2—Ashburton A. and P. at Ashburton.

November 3—Amberley A. and P. at Amberley.

November 3 and 4—Manawatu and West Coast A. and P. at Palmerston North.

November 7 and 8—Thames Valley A. P. and H. at Te Aroha.

***November 8, 9, and 10—Canterbury A. and P. (Royal Centennial Show) at Christchurch.**

November 10 and 11—Wanganui A. and P. at Wanganui.

November 10 and 11—Whangarei A. and P. at Whangarei.

November 11—Waihi A. and P. at Waihi.

November 15—North Otago A. and P. at Oamaru.

*November 17 and 18—Egmont A. and P. at Hawera.

November 18—Waimate A. and P. at Waimate.

November 18—Bay of Islands P. and I. at Waimate North.

November 18—Taieri Agricultural Society at Outram.

November 21 and 22—Otago A. and P. at Dunedin.

†November 24 and 25—Auckland Metropolitan A. and P. (spring show) at Auckland.

†November 24 and 25—Nelson A. and P. at Nelson.

November 24 and 25—Stratford A. and P. at Stratford.

November 25—Kaikohe A. P. and H. at Kaikohe.

November 25—Kelso A. and P. at Kelso.

December 2—Winton A. and P. at Winton.

December 2—Motueka A. and P. at Motueka.

December 2—Tokomairiro A. and P. at Milton.

December 2—Whangaroa A. and P. at Kaeo.

*December 5 and 6—Gore A. and P. at Gore.

December 9—Wyndham A. and P. at Wyndham.

December 12 and 13—Southland A. and P. at Invercargill.

January 1—Nuhaka A. and P. at Nuhaka.

January 12 and 13—Wairoa County A. and P. at Wairoa.

January 13—Blueskin A. and P. at Waitati.

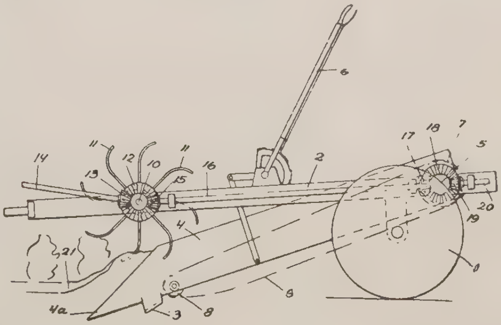
* The Department of Agriculture exhibit will be staged at this show.

† The dates of these shows have been changed from November 17 and 18 owing to the holding of the local body elections on November 18.

Recent Patent Specifications for Farming Inventions

The following particulars of recent patent specifications of interest to farmers have been selected from the Patent Office Journal issued on July 24, 1950, and are published by permission of the Commissioner of Patents, Wellington. Photostat copies of any specification will be supplied for a small fee on application to the Patent Office.

No.	Description.	Applicant.
98597	Potato Digger,	N. V. Nilsson.



[Only those references which are necessary to an understanding of the specification are quoted in the abridgment below.]

To avoid the disadvantage, common in ordinary potato diggers, of roots and vines gathering around the edges of the side shields and thereby impeding proper progress of soil and potatoes toward the delivery end of the digger, a shaft 10, transverse to the direction of travel, carries a number of pins 11 of which the two outermost pins move in a plane immediately outside their adjacent shields 4. The peripheral speed of the pins 11 is greater than the driving speed of the potato digger and in the opposite direction of its forward movement so that roots and vines or the like adhering to the side shields will be thrown by the pins backward along the machine. The vines are thereby pulled loose from the scooped-up soil mass and are thus removed from the operational area of the digger. Details as to the construction of the power drive for shaft 10 and an elevator 9 are also given.

No.	Description.	Applicant.
90414	Butter Production (Salt Addition in Continuous Process),	Aktiebolaget Separator.
93044 93066	Continuous Process of Buttermaking,	Aktiebolaget Separator.
95396	Plough Lift,	A. J. Chapman and R. E. Burney.
95421/2	Cloche for Plants,	Chase Protected Cultivation Ltd.
95876	Plant-hormone Compositions,	American Chemical Paint Co.
96558	Potato Sorter and Bagger,	S. Malthus.
96757	Insecticide Compositions,	N. V. De Bataafsche Petroleum Maatschappij.
97203	Hay Baler (Pick-up Type),	International Harvester Co.
98358	Dissemination of Insecticides,	The Wessex Aircraft Engineering Co., Ltd.
99245	Crop-lifting Attachment for Harvester,	C. Galbraith.
100017	Flower-pot Moulding Machine,	A. S. Kerr.
100847	Cap for Milk Bottle,	C. D. Birchfield.

Verticillium Wilt of Stone Fruit

By R. I. JUNE, Orchard Instructor, Department of Agriculture, Hastings.

VERTICILLIUM wilt is a fungous disease which has become fairly widespread in New Zealand. It attacks a wide range of plants and has recently become serious in some districts where it has been found to affect stone fruit trees of various kinds.

VERTICILLIUM wilt (*Verticillium dahliae*) is a soil-borne fungous disease which was first recorded in New Zealand on stone fruit in the Alexandra district, where it had attacked apricots. The Plant Diseases Division of the Department of Scientific and Industrial Research first recorded the outbreak in 1945. The symptoms were clearly described by L. R. Renouf in the September, 1948, issue of the "Journal". Since then it has been recorded in Hawkes Bay on peaches, apricots, and plums. The infected plum trees were found in July, 1949, and this was the first time the disease had been isolated on this type of fruit tree in New Zealand.

Host Plants

Tomatoes and potatoes are hosts for verticillium wilt, and it is undoubtedly the interplanting of these crops during the establishment of stone fruit orchards which has caused the spread of the disease more than any other factor. Tomatoes are grown extensively in districts where there are canneries demanding the production of large areas of this crop.

The symptoms of verticillium wilt on tomatoes and potatoes are very easily overlooked in a field crop where it has not been of a particularly severe nature. Therefore many crops are harvested with the disease present and undetected.

There are various common weeds which are also hosts to this fungus. Fat-hen and black nightshade are two of them. It is also common in garden flowers such as asters, zinnias, stocks, etc. The official recorded lists of the Plant Diseases Division of the Department of Scientific and Industrial Research also include tobacco, egg plant, cucumber, raspberry, gooseberry, maple (*Acer palinatum*), and deadly nightshade (*Atropa belladonna*). It has also been recorded in other countries as having affected cherries, strawberries, black currants, quinces, and hops.

As the disease organism can remain in the soil for many years and in land that is free of infected crops or weeds, there is danger in planting out susceptible crops for at least 3 or 4 years.

Incidence of Disease

Affected trees, particularly peach trees, are found in widely spread areas throughout the Hawkes Bay district. Younger trees from 1 to 8 years old are the most seriously affected. In some trees it may show only in a lateral branch or two and in others in one or more main branches; in some instances whole trees have succumbed. It is not often that an established tree is killed outright by the disease, but it appears to be the cause of many newly planted trees failing to live through the first year. Growers would be well advised to make sure that nursery stock has not come from an infected area of land.

Trees quite seriously affected in the 1948 season made good spring growth in 1949, but were showing large areas of bare wood. It would appear that trees, once affected, will always be weak and may collapse later if growing conditions become adverse. It is known that the disease may live in the tree almost indefinitely, but may show only the symptoms of wilting and leaf drop in very dry seasons. The most seriously affected area of peach trees in the Hawkes Bay district is in a young orchard planted on an area of land that had been used for tomato growing for many years before planting.

In all cases where the disease has been evident the trees either have been planted on land previously used for tomato or potato growing or have had these crops interplanted during the establishment period before economic crops of fruit were produced.

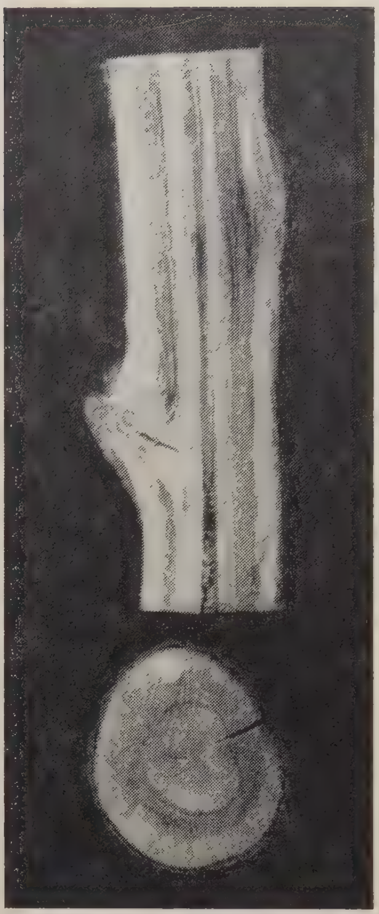
Symptoms

Verticillium wilt may first be detected on stone fruit by the wilting and yellowing of the lower leaves of young wood. These leaves soon drop, but those at the growing tip remain green and apparently unaffected unless it is a very severe attack. In a severe attack the whole length of young wood will die back and leaders or whole trees will collapse. It is in the stage when the tips are still green but wood below is bare that the trouble is very noticeable.

In Australia the disease is known by the descriptive term black heart disease. When the wood is cut a dark-brown discoloration is observed. In some cases, in young wood particularly, this may show as a ring just beneath the bark. Usually, however, dark areas may be found in patches or rings through the wood as deep as the core (see the illustration above). This discoloration is often noticed during pruning operations where the disease was not severe enough to be seen during the growing season. The bark on diseased branches is dark, dry looking, and slightly withered.

Cause and Control

The fungi of the wilt gain access to the roots of the tree from the soil in which they are borne. They attack the woody tissue, poisoning the flow of life-giving sap, which causes the foliage to wilt. The fungus is left in the soil by diseased plants and may be further spread by cultivation or very easily by the run-off of rain or irrigation water. An area of apricots has been noticed which was badly infected by run-off from an irrigated crop of tomatoes. Only the trees in the vicinity of the run-off were affected.



[*R. W. Orr photo.*

Peach wood discoloured as the result of an attack of verticillium wilt.

Control measures are difficult. The fungi can be eliminated by soil sterilisation such as is practised in glasshouses, but of course this would not be economical on areas as extensive as an orchard. Where only parts of the tree are badly affected they should be cut well back and the cuttings burnt. The cuts should be sealed with a bituminous dressing. The tree may or may not recover, as the wood in the base of the tree may be affected. Where a tree is seriously affected all over it is advisable to remove the whole tree.

As trees of a susceptible kind will become infected when used as replacements for those removed, soil sterilisation may then be economical. Chloropicrin at the rate of 4 c.c. per square foot will give complete control, providing the soil is in a reasonably moist condition and is properly sealed after application. Sealing may be done with sacks, tarpaulin, or water. Formalin (40 per cent. formaldehyde) will also give protection at the rate of 1 gallon to 49 gallons of water. This is sufficient to treat 10 to 15 square yards according to severity of infection.

Recommendations

Recommended practices which will assist in avoiding an attack of verticillium wilt are:—

1. Apricots, peaches, or plums should not be planted on land previously used for growing tomatoes or potatoes for at least 3 or 4 years. The land should be fallowed or kept free of host weed plants if other crops are grown in the meantime.

2. Where infection has already occurred the land should not be allowed to become too dry. The disease is more severe in very dry seasons, so irrigation may be used to advantage.

3. Weeds such as fat-hen and nightshade should be eradicated.

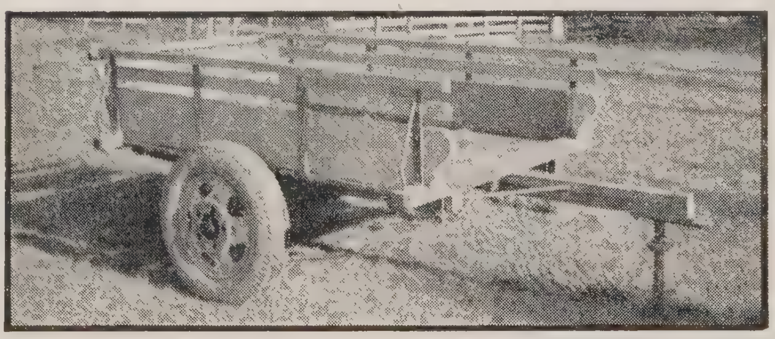
4. Irrigation and other run-off water should not be allowed to flow through wilt-infested land into a stone fruit area.

5. Badly affected trees should be removed, 4 years or more being allowed before replanting unless a non-susceptible type of fruit tree is chosen. So far apple and pear trees have not been known to contract the disease.

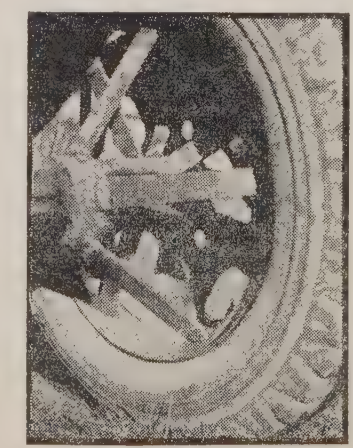
6. Care should be taken to ensure that the source of the trees to be planted is free of disease and that the land in which they have been raised has not previously been used for tomato or potato production.

7. Soil sterilisation may be used to eliminate the risk of reinfection where replacements are necessary.

Converting Dray to Farm Trailer



ALTHOUGH horses are largely being replaced by mechanised equipment, farmers still have a large number of drays that in their present condition are more or less useless. These drays can be converted at very little cost into strong trailers that will carry a 3-ton load. Sometimes the spokes are shortened and a truck tyre and rim are fitted on the outside, but the method is fairly expensive. A cheap and very satisfactory way of converting a dray is shown in the illustrations.



All the wood was removed from the wheel, leaving only the inner steel hub, on to which a rim from a heavy truck was welded.

It will be noted that the rim is fixed so that the wheel is over the outside end of the axle and therefore clear of the side of the dray. As the hub is cast metal, it was first necessary to shrink or bronze weld two collars on to it to take the welding, these collars being strengthened in position by horizontal iron straps. The iron stays were then welded to the collars, at a total cost, excluding the rim and tyre, of £3 per wheel.

Old drays can often be bought very cheaply at sales and if converted in this manner make a trailer that will stand up to many years' hard work.

—*R. INCH, Fields Instructor, Department of Agriculture, Ashburton.*

Danger from D.N.O.C. Sprays

IN the past D.N.O.C. (di-nitro-ortho-cresol) weedkilling sprays have been sold in New Zealand under the trade names of "Denoc", "Sinox", and "Selectone". It was early realised that these weedkillers were a danger to both stock and man if taken internally. However, they have been used almost exclusively in New Zealand on pea crops where stock do not graze and where they have been destroyed by soil bacteria before stock could be put on the field.

Spray operators working on a small scale usually suffer no discomforture other than a yellowing of the skin where it came into contact with the spray. On the other hand, however, in England where large-scale spraying is performed at least five deaths have occurred.

Of the new, more toxic D.N.O.S.B.P. compounds (di-nitro-ortho-secondary-butyl-phenate) marketed in New Zealand as "Sinox W", "Sevtox", and "Selectone Selective", the Weeds Research Committee (a body coordinating research work on the control of weeds in New Zealand) issues a grave warning of the danger associated with these compounds.

The committee strongly recommends that spray operators using the old D.N.O.C. and the new D.N.O.S.B.P. weedkillers should wear adequate protective clothing and should protect eyes, nose, mouth, and hands from the spray. To this end it is suggested that a boiler suit buttoned up to the neck should be worn and changed frequently, motor-cycle goggles and a respirator be used to protect the eyes, nose, and mouth, rubber boots be worn, and either rubber or leather gloves be used at all times when the spray materials are handled.

An added precaution is to smear the skin with a light coating of petroleum jelly. The spraying machine should be thoroughly washed down after use. Mixing and spraying should be done across wind so that spray and fumes are carried away from the operator.

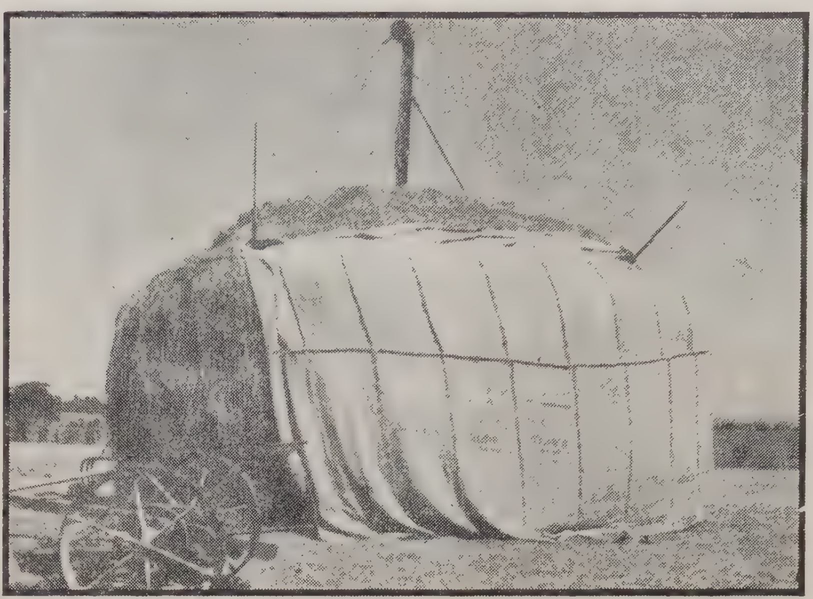
The danger is possibly more acute in hot weather, say, with temperatures of 85 degrees F. or more. The pores of the skin tend to open under these conditions, allowing the easier access of the toxic material.

These sprays are a valuable acquisition to the list of chemical weedicides and their use should not be discontinued because, provided adequate precautions are taken to protect operators, they can be used with safety. It should be noted that the general range of the "hormone" type of weedkillers (M.C.P., 2, 4-D, and 2,4,5-T) in contrast are not injurious to man or beast.

Silage Making, Subterranean Clover, Fertilisers for Potatoes

SEASONAL NOTES
Contributed by the EXTENSION DIVISION

SEASONAL work for the provision of supplementary feed for next winter should now receive attention. North Island farmers will be concerned with the provision of ample hay and silage, while South Island farmers will rely largely on root and green forage crops, although the practice of wintering ewes on lucerne hay is expanding in Canterbury. In both islands the wider use of short-rotation ryegrass would improve winter livestock feeding on both dairy and fattening farms, and all plans for autumn pasture sowings should be made with due consideration for a wider use of this valuable winter feed producer.



When building a silage stack use a sheet to protect the stack from strong winds.

* * *

SILAGE

The earlier a pasture is cut for silage the higher will be the feeding value of the material ensiled and the better the grazing secured from the aftermath. Every endeavour should be made to cut pastures for silage before the flowering of the chief grasses present.

* * *

STACKING SILAGE

With dry material, harvesting and stacking should proceed as rapidly as possible; with succulent material, harvesting need not proceed so rapidly except toward the completion of the stack, as the last portion is always liable to overheating. In making stack silage the sides of the stack should be kept perpendicular to avoid excessive waste, and in windy weather a tarpaulin placed round the windward side of the stack will assist in maintaining even temperature and settling and reduce the risk of the stack falling over.

* * *

COVERING STACKS

Though most silage stacks are covered with earth, it has been found in certain districts that if the grass ensiled is in the leafy stage, good silage can be made without covering it, provided that for three successive days after completion the stack is tramped for 15 to 20 minutes to exclude air from the top layer.

* * *

SUBTERRANEAN CLOVER

Subterranean clover is being used increasingly to improve the production of dry-land pastures. Subterranean clover is an annual, and there are three main essentials in the successful establishment of the plant: Sowing at the right time, adequate topdressing with phosphates (and lime if necessary), and spelling in the first flowering season.

* * *

FIRST-SEASON SPELLING

As subterranean clover is an annual, it is essential to obtain a good reseeding the first season. For this reason it is imperative that the stand should be spelled in late spring and early summer, when the plants are sending out runners and forming seed. Even a moderate strike of subterranean clover can be transformed into a good stand in the following autumn if the area is properly spelled. On the other hand if an excellent strike is heavily grazed in late spring and early summer, it may result in ultimate failure or at best a patchy sward. The importance of allowing a first-season seeding cannot be overemphasised.

* * *

PROLIFIC RESEEDING

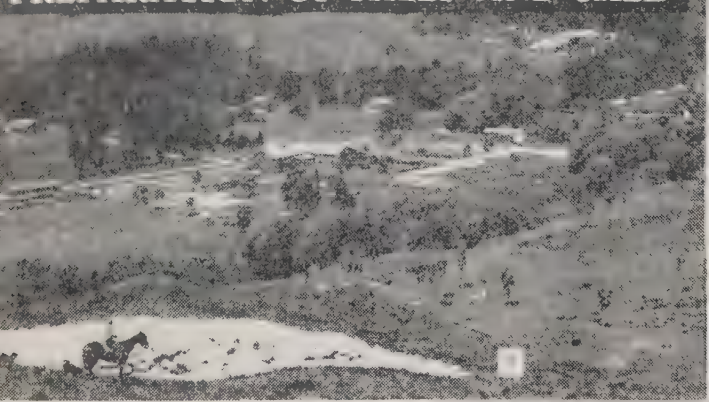
Once a good cover of subterranean clover has been established by reseeding no further special treatment need be given in future years. The reason for this is that one good reseeding will allow several hundred pounds of seed to the acre to be shed compared with an original sowing of 4 or 5lb. Well-established stands of subterranean clover have been known to re-establish and still provide a good cover after two successive years of grass-grub attack.

* * *

FERTILISERS FOR POTATOES

The average increase in yield of potatoes from an application of 3cwt. per acre of superphosphate in 93 experiments has been 14cwt. per acre or a 14 per cent. increase. A hundredweight per acre of sulphate of ammonia in addition to 3cwt. of superphosphate raised yields in 105 trials by an average of a further 8cwt. per acre or a 7 per cent. increase. Sulphate of potash at 1cwt. per acre in addition to 3cwt. of superphosphate and 1cwt. of sulphate of ammonia raised potato yields in 97 experiments by an average of 2cwt. per acre or a 1½ per cent. increase. Based on these figures the standard fertiliser recommended for potatoes is a 3:1 mixture of superphosphate and sulphate of ammonia applied at varying rates per acre according to the type of crop and locality. Where a potash response is likely the mixture usually recommended is 3:1:1 of superphosphate, sulphate of ammonia, and sulphate of potash. A series of trials conducted in recent years showed that the effect of sulphate of ammonia in increasing yield was most marked where it had been applied with the seed. It is recommended, therefore, that all the fertiliser be applied in the furrow with the seed.

PREPARATION OF SHEEP AND SHED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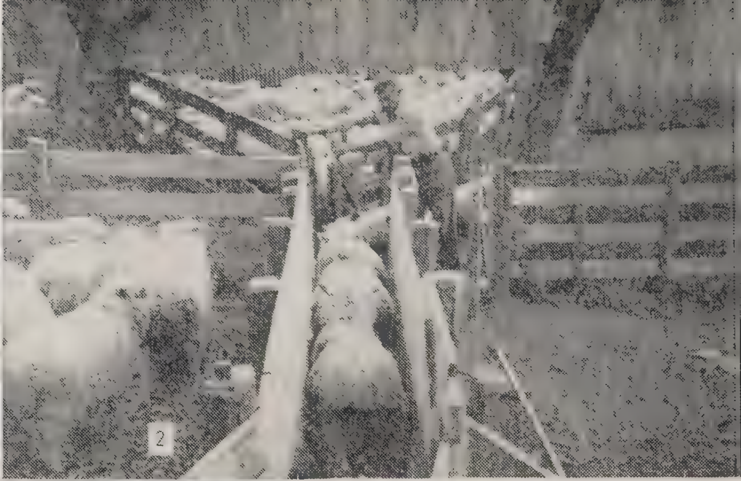
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Fig. 1—Sheep brought in for shearing should be spelled before shedding up, otherwise the pens in the shed get very dirty and much wool is stained. Where possible avoid a dusty road for the final lap to the woolshed. Dust can lower the value of a clip, sometimes by pence per pound, besides being hard on combs and cutters.

Fig. 2—Draft off wethers from ewes and hoggets from adult sheep before shearing. Hogget wools are finer than the fleece from grown sheep, and wether and ewe wools can differ considerably.

Fig. 3—Dagging sheep before they enter the shed is sound practice. One daggy sheep can stain quite a few clean sheep when penning up is in progress. This green stain is looked on with disfavour by the wool buyer.

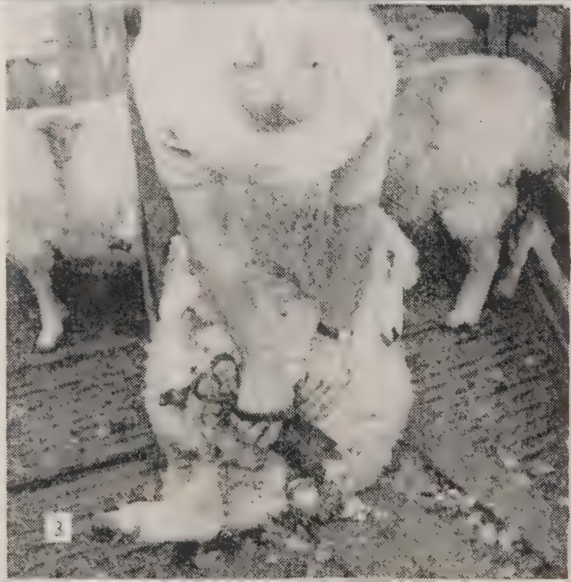
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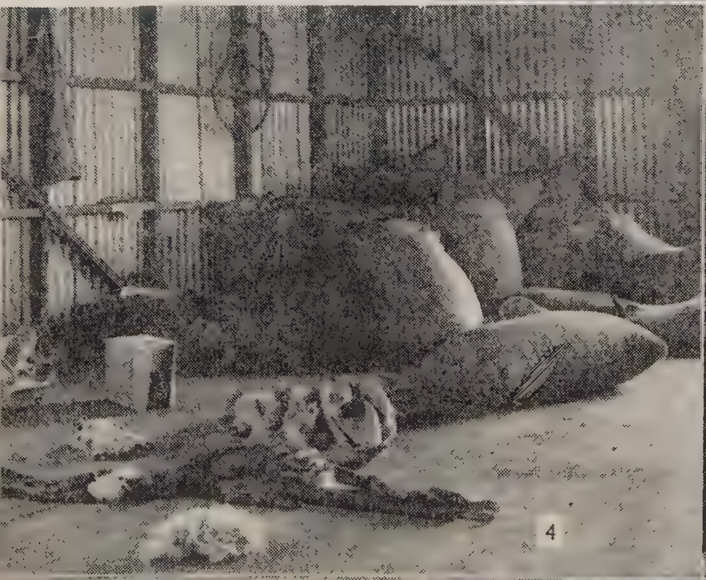
Fig. 4—Clean out the wool room. Such sights as that shown are common on the first day of shearing. A clean and orderly wool room is more likely to inspire clean and orderly work.

Fig. 5—Boards which fit between cleats on opposite legs of the table keep the locks from being trampled on.

Fig. 6—The scrubbing of the shearing board and the wool table is an essential practice. A disinfectant mixed in the water used to scrub the board protects both the shearer and the sheep.

Fig. 7—When dealing with large Romney fleeces a table large enough to hold the whole fleece is necessary. The dimensions recommended are 9ft. x 4ft. x 3ft.

Fig. 8—Folding bins are useful in a shed, because when the bins are not in use they can be folded back to afford more space to store things in the off season.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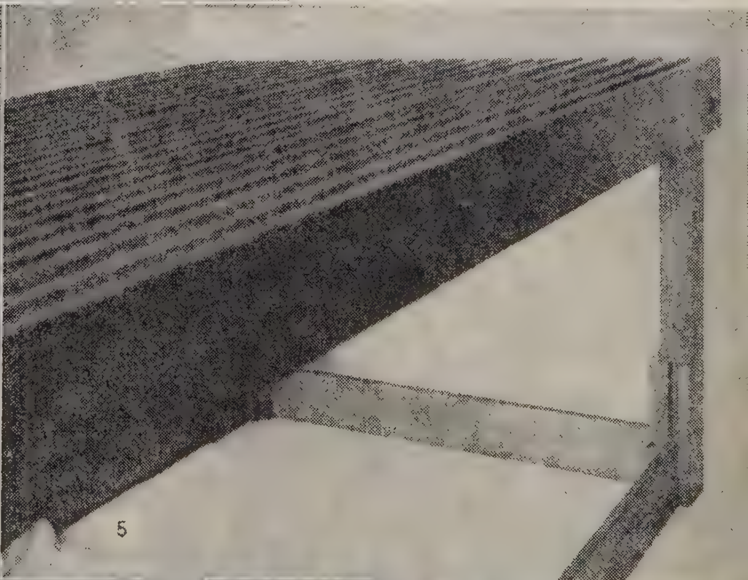
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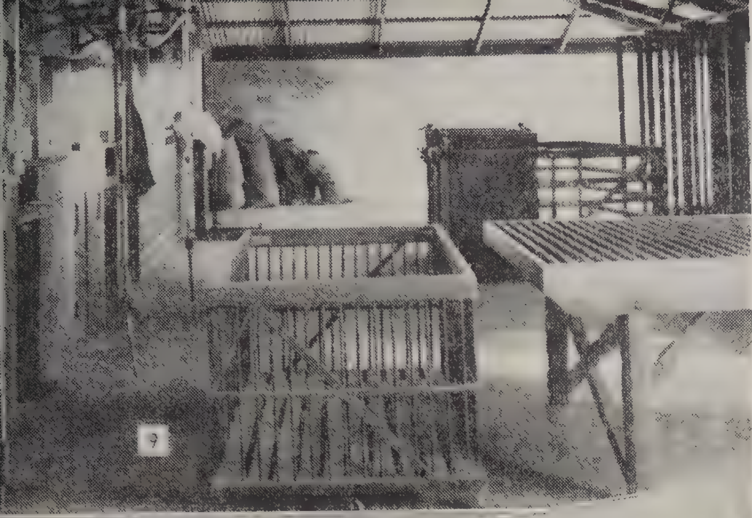
WOOL VALUES ENHANCED BY CARE AT SHEARING

THE sheep farmer will have to decide in the next few weeks what preparation, if any, he will give to his wool clip before he markets it. High prices may easily create a feeling that little or no attention need be given to the wool clip, as can be seen by the number of "all-in" clips which have been displayed for sale in recent years. Pressing the fleece wool with all the skirtings, bellies, stains, and, in some cases, dags still adhering to it is to be deplored and costs the farmer far more in loss of revenue than if he had hired one or two table hands at shearing to skirt his fleece wool for him.

Several essential points which the farmer must attend to if he wishes his wool clip to go on to the show floor in its most attractive form are presented in these pages by H. R. Lusk, Sheep and Wool Instructor, Department of Agriculture, Wellington.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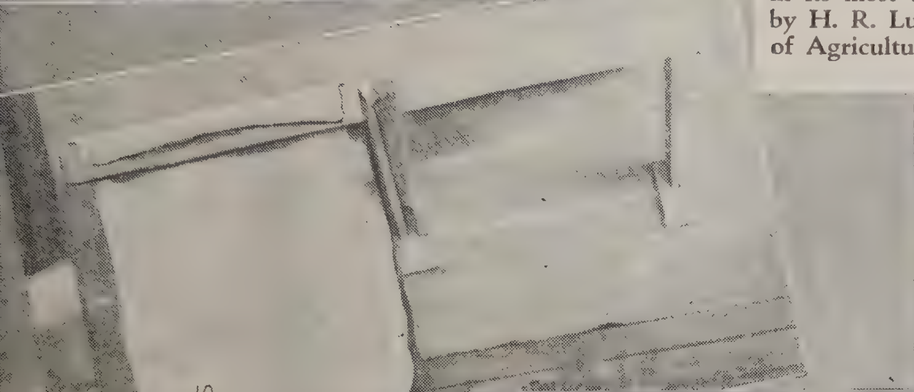
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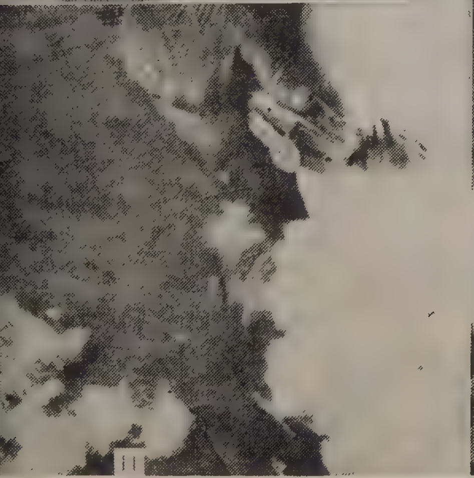
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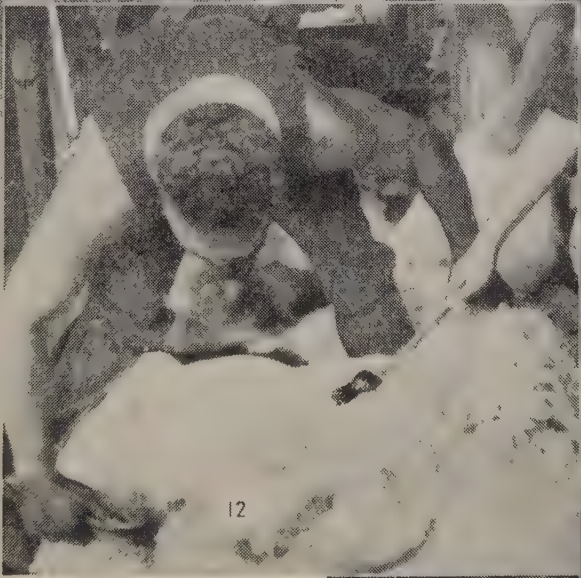
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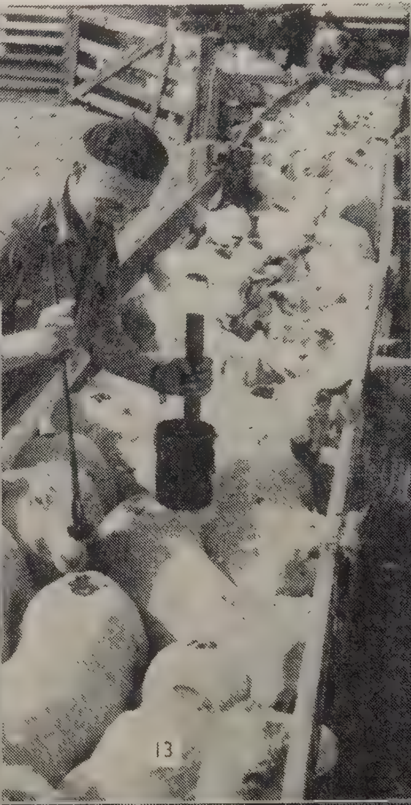
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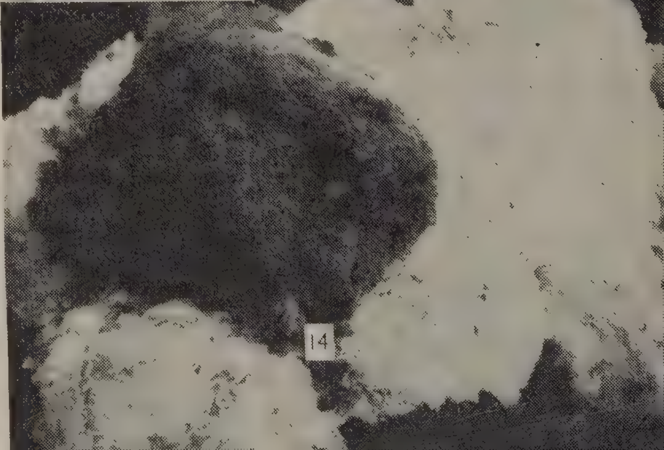
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Fig. 9—Baskets or skeps on wheels are handy for holding pieces and can be wheeled to the press from the table, thus saving much of the labour of carrying from the bins to the press.

Fig. 10—Frames hinged to a wall can be very useful to support a wool pack for bellies, necks, etc.

Fig. 11—An efficient shearer will not make many "second cuts", but the presence of them among the fleeces in a bale will antagonise the wool buyer.

Fig. 12—Use a disinfectant for dressing cuts during shearing. Never use tar, because it is non-scourable and is an illegal substance when used on wool, besides having very little antiseptic value.

Fig. 13—When branding sheep use only an approved branding preparation. Look for the words "An approved wool-marking preparation for purposes of the Stock Act, 1908" on the container. For thinning down the preparation use power kerosene or petrol; never use oil.
[*Sparrow Industrial Pictures Ltd. photo.*

Fig. 14—Never mix black wool with white. Black wool and white fleeces with stray black fibres mixed in will antagonise the buyer.

HANDLING THE WOOL CLIP

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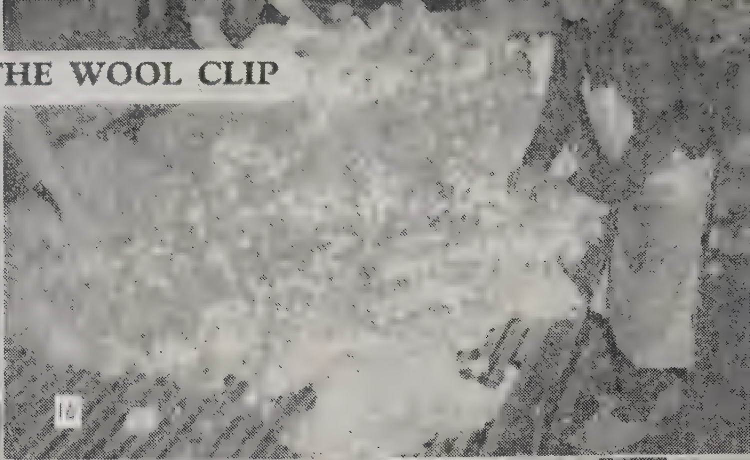
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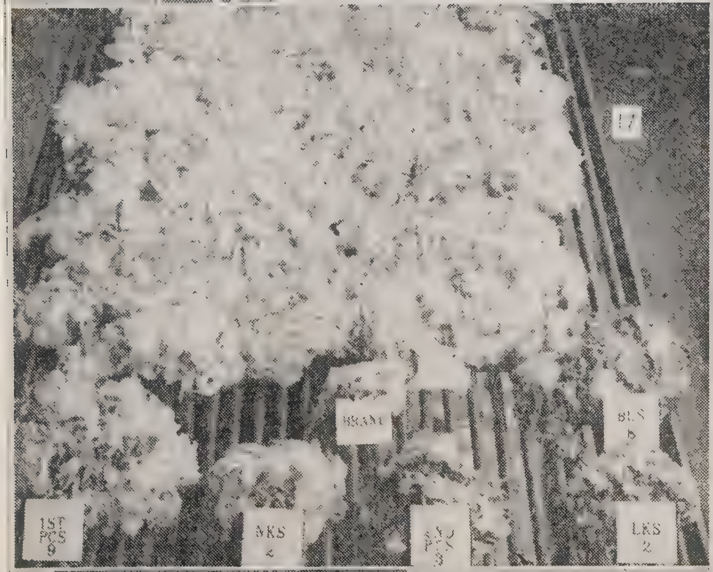
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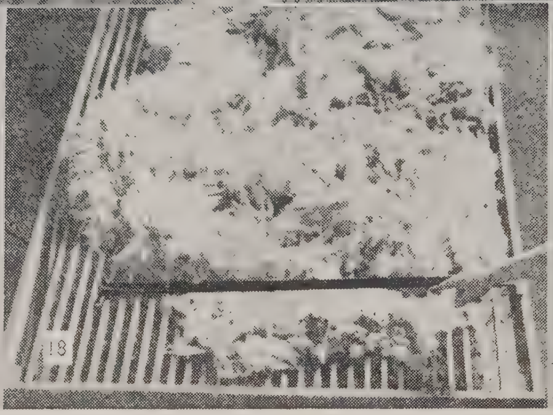
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Fig. 15—The removal of the belly wool by the shearer should be insisted on. Wether bellies are stained and usually are wet. If they are pressed up with ewe bellies or other wool, the result will be heating and further staining in the bale, so always take out the stained pieces.

Fig. 16—Skirting should always be done at shearing time. The dirty ends are plainly seen and easily dealt with at this time and nothing is missed. [*Sparrow Industrial Pictures Ltd. photo.*

Fig. 17—The approximate percentages of oddments which should be skirted from a typical crossbred fleece, provided it is free of seed or other contamination.

Fig. 18—The shoulder wool is the most valuable part of the fleece. Be careful, therefore, when taking off necks to remove only the matted collar.

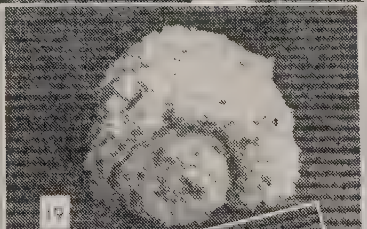
Fig. 19—Roll the fleece to show the best wool. This method is a good one, because when the roll is completed the shoulder wool is shown to the best advantage.

Fig. 20—Another method is to roll the fleece from both ends. This facilitates unrolling of the fleeces if they are to be rehandled in store.

Fig. 21—A diagram of the two methods of rolling. The white portion represents the shoulder wool, the grey portion the bulk of the fleece, and the black strip the inferior back wool.

Fig. 22—Until a few years ago presses were built to take three sizes of pack and were supplied with a false bottom. This is how a 42in. pack looks in a press minus its false bottom.

Fig. 23—With the false bottom in the press, the 42in. pack is still too short and results in a round-butted bale when pressed up.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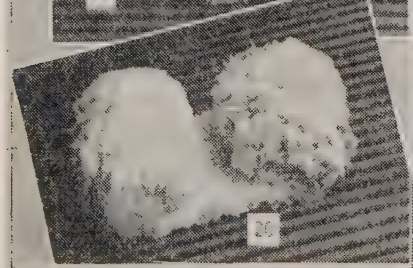
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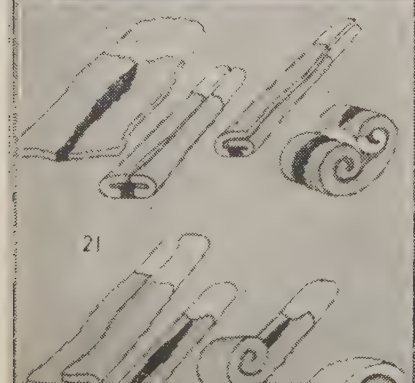
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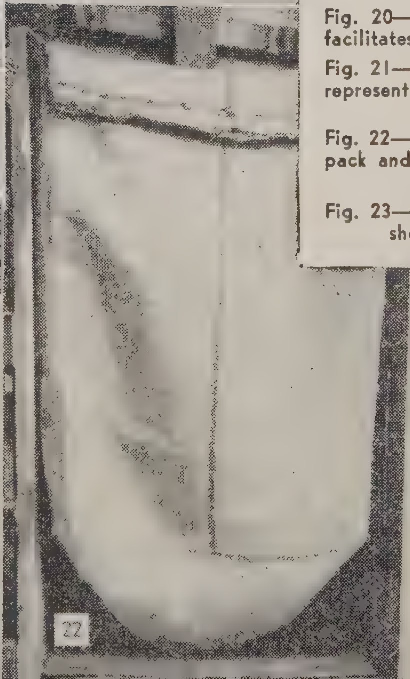
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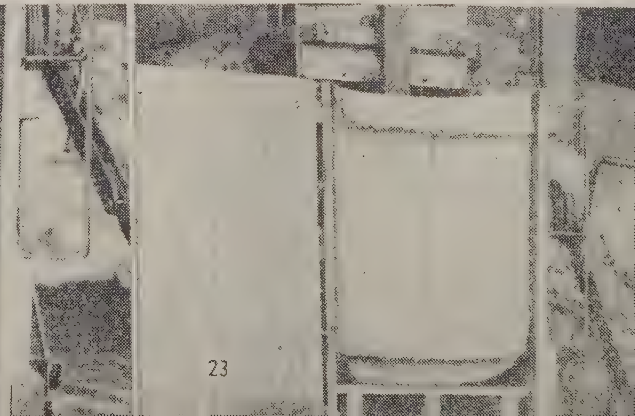
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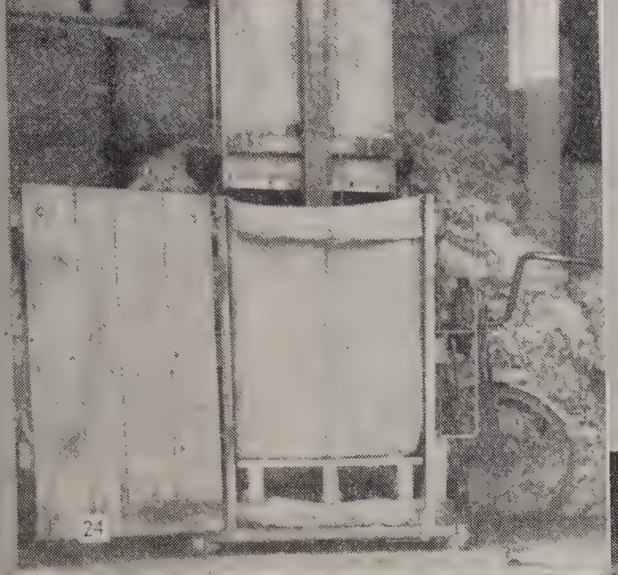
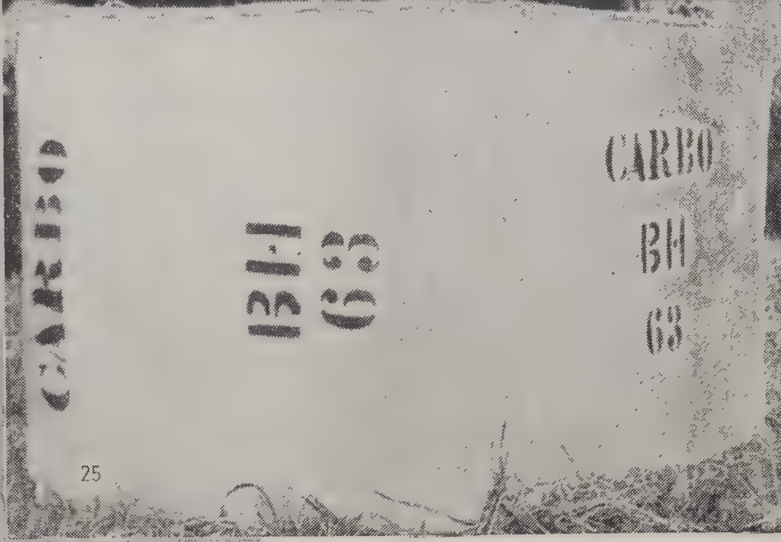
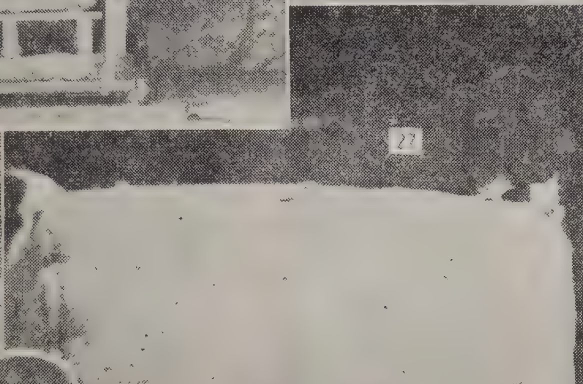
HANDLING THE WOOL CLIP







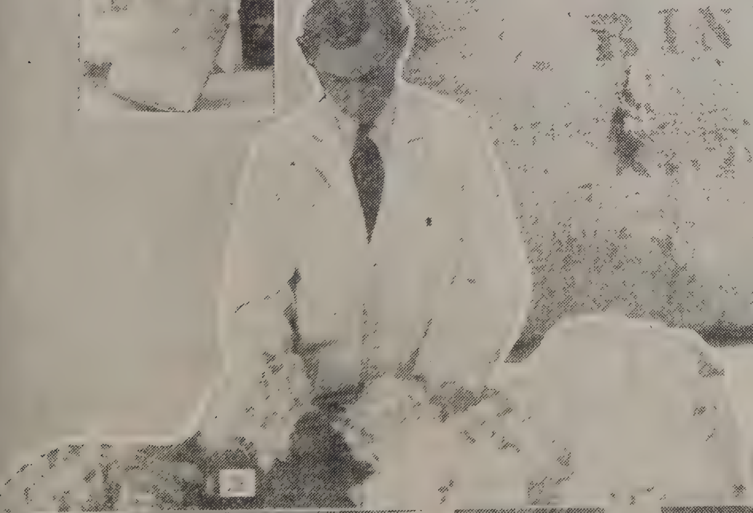


Fig. 24—Today the 42in. pack is the standard size for New Zealand. Pack up the false bottom therefore so that all four corners of the pack are just touching the bottom.

Fig. 25—Bales should be branded on the cap and one side only, and an area in the centre of the cap should be left clean to avoid smudging.

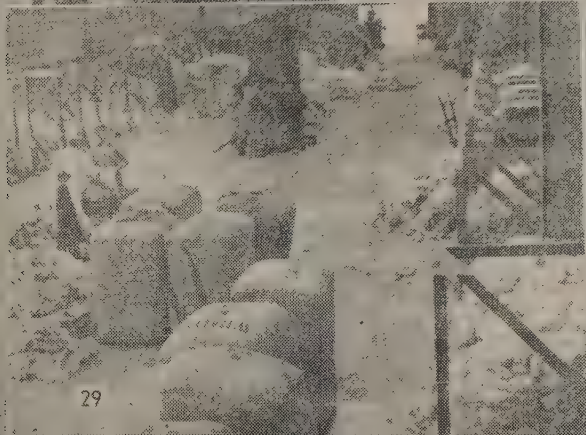
Fig. 26—Round-butted bales cause endless trouble, as they will not stand upright and are difficult to stack.

Fig. 27—Where bales are branded in the centre of the cap the owner's brand is sometimes obliterated in transit, causing confusion in brokers' stores. For his own information and as a check on the pressers a farmer is wise if he keeps a record of the number of each bale and what is pressed in it. It is definitely in the grower's interest to fill in a specification sheet to send with his clip. This speeds up storage and stacking in the broker's store.

Fig. 28—Pick over lambs' wool. Pick out stained wool, face pieces, leggings, and topknots, as these wools make the buyer suspicious and have a detrimental effect on the price.

Fig. 29—The broker has a good binning system and can handle most of the oddments. If a line of four bales cannot be made, send the wool in for binning.

Fig. 30—The final say: It will pay the grower handsomely to get this type of reaction when his clip is being sold. Attention to even a few of these hints may ensure this result.



PRIMARY PRODUCTION MONTHLY REVIEW

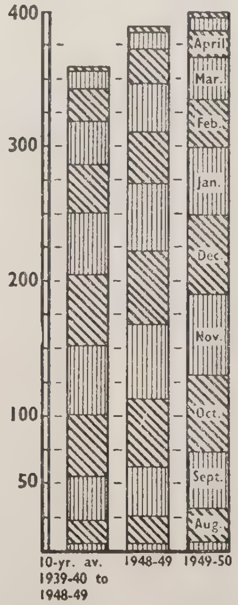
From data supplied by the Statistical Section, Extension Division, Department of Agriculture, Wellington.

DAIRY PRODUCE (FACTORY PRODUCTION ONLY)

Season July 1 to June 30: Order of months July to June reading upward in each column

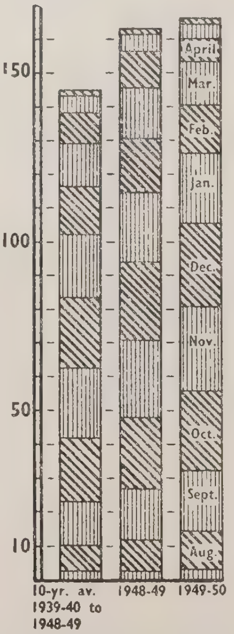
BUTTERFAT USED FOR BUTTER AND CHEESE

Millions of pounds



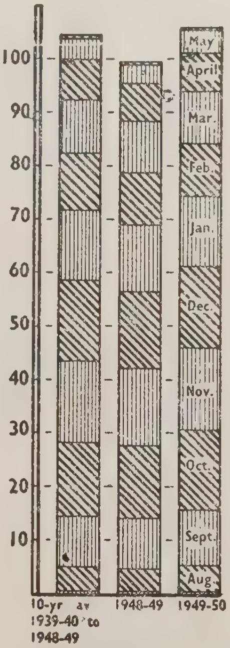
CREAMERY BUTTER

Thousands of tons



CHEESE

Thousands of tons

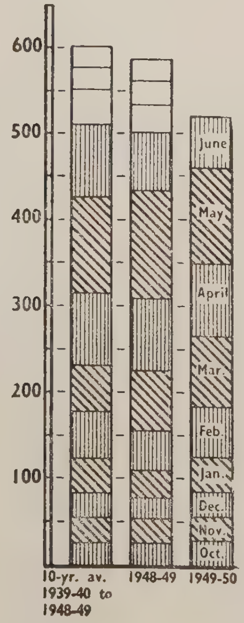


LIVESTOCK SLAUGHTERED AT MEAT EXPORT WORKS AND ABATTOIRS

Season Oct. 1 to Sept. 30: Order of months October to September reading upward in each column

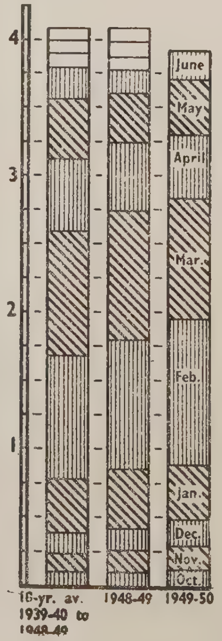
CATTLE

Thousands of carcasses



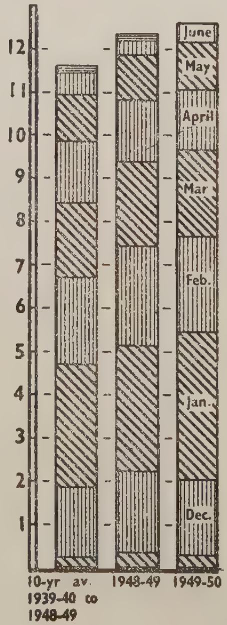
SHEEP

Millions of carcasses



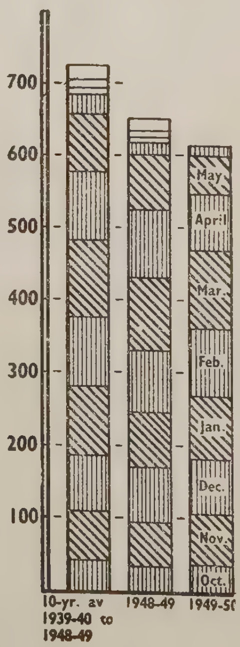
LAMBS

Millions of carcasses



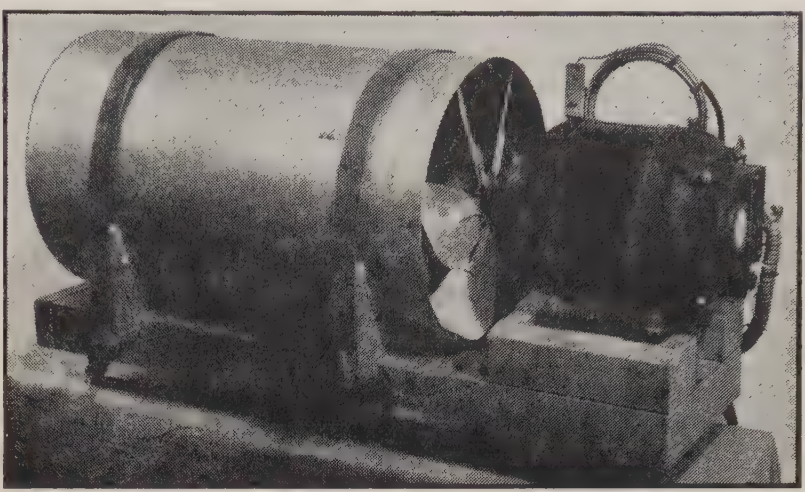
PIGS

Thousands of carcasses



WARMING-ROOM UNIT FOR COMB HONEY

WARMING combs before extracting the honey is becoming a popular procedure with commercial beekeepers, because it speeds up the rate of extraction and assists considerably in the clarification of the honey. In this article C. R. Paterson, Apiary Instructor, Department of Agriculture, Hamilton, describes a compact, mobile warming - room unit which he has designed. The construction of insulated warming rooms will be the subject of a later article. A drying plant which will remove excess moisture from comb honey and honey in settling tanks by indirect heating and lowered humidity was described in the June, 1947, issue of the "Journal".



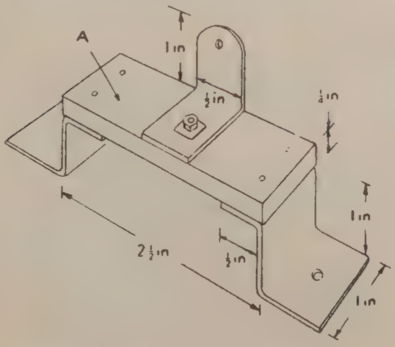
Warming-room unit, showing the fan and motor. The divided wooden blocks which can be seen under the motor allow greater movement of air around the motor.

FOR the past 25 years some commercial beekeepers in New Zealand have realised the benefit of having a warming room in which combs of honey could be placed before extracting the honey. Such a room enables the beekeeper to remove large quantities of honey from the hives during fine weather so that normal extracting operations can proceed when weather conditions are unsuitable for outside apiary work.

Until recently, however, the warming rooms in use were not very satisfactory, because a method of circulating air was not incorporated with the heating device. The reason for this no doubt was that electricity, with its satisfactory automatic form of control, was not available to most beekeepers. Today the position is changed and there are very few honey houses that are not powered by electricity.

The component parts of the unit are as follows:—

Motor: This is a ¼ h.p. electric motor with a speed of approximately 1420 revolutions per minute.



Insulated bracket for elements. A—Insulated material.

Fan: A 4- or 6-bladed fan of 10in. diameter is used. The blades should be set to give the maximum movement of air of which they are capable.

Heating elements: Two 1000-watt radiator elements are used. Insulated clips are made for fastening them to the wind tube.

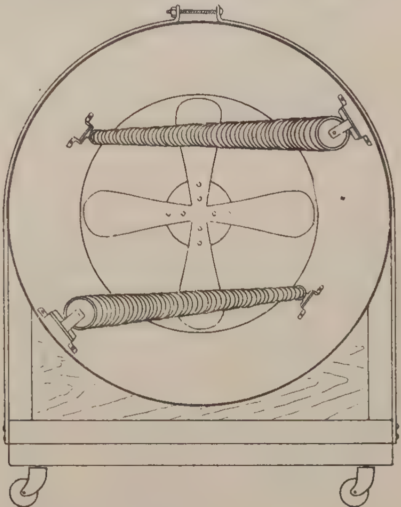
Wind tube: Approximately 20-gauge flat iron is used for the wind tube, which is 10½in. in diameter and 20in. in length.

Thermostat: This is the most important part, because the reliability of the unit is dependent on the switching on and off at the required temperatures of the motor and heating elements. Particular care should be taken to see that it is of the desired capacity; that is, it should be capable of dealing with the current required to operate the two 1000-watt elements and the ¼ h.p. motor.

The construction of the heating unit is comparatively simple and straightforward. Purchase, if possible, a ready-made 10in. fan, but if one has to be made see that the blades are securely fastened to the hub flange. Put plenty of set on the blades to ensure a maximum movement of air, otherwise there will be a possibility of honey near the unit becoming too hot. In one instance a heating unit was used in which a small fan was not moving the required amount of air and several tiers of combs became overheated and collapsed. Make sure also that the fan is securely fixed to the motor shaft. For smooth running have the fan evenly balanced and see that it is rotating in the correct direction; that is, blowing the air through the tube away from the motor.

Wind tube: A piece of 20-gauge flat iron 20in. x 33¾in. will allow a turn-over of ¼in. on each end for a seam and the sheet can be shaped into a tube 10½in. in diameter and 20in. in

Protection grid. A strip of asbestos can be seen between the woodwork and the metal tube.



Grid removed, showing method of fixing elements in wind tube.

WARMING UNIT FOR COMB HONEY . . .

length. With a 10in. fan rotating inside, the tube must be symmetrical and kept in that shape by the wooden blocks and the straps of hoop iron shown in the upper illustration on the previous page. Strips of asbestos are placed between the woodwork and the metal tube.

Heating unit: Two 1000-watt radiator elements of the rod type are required. To hold these in position inside the wind tube four insulated brackets should be made as shown on the previous page. These are securely bolted to the sides of the tube. The heating elements are arranged to allow the air to attain the greatest possible heat as it is forced through the wind tube.

A guard in the form of a grid is fitted on the end of the tube to protect the elements and as a safeguard against mishap.

The motor and fan are mounted on two blocks of wood to give the correct height and to allow the fan to rotate just inside the wind tube. They should be securely bolted to the wooden base. To allow the unit to be moved four furniture castors should be placed on the base as shown on the previous page.

The only other appliance required is the thermostat. The wiring of this unit will require to be done by a qualified electrician so that it will be best to let him secure the correct type. As there are so many different makes and types of thermostats, care will have to be taken to see that it gives the temperature range required and cuts off at 90 to 95 degrees F.

The mercury tube type should be mounted in a vertical position alongside the motor. Other types may be mounted on the top of the motor. Whichever type is used, see that it is placed where it will not be knocked easily when the unit is moved.

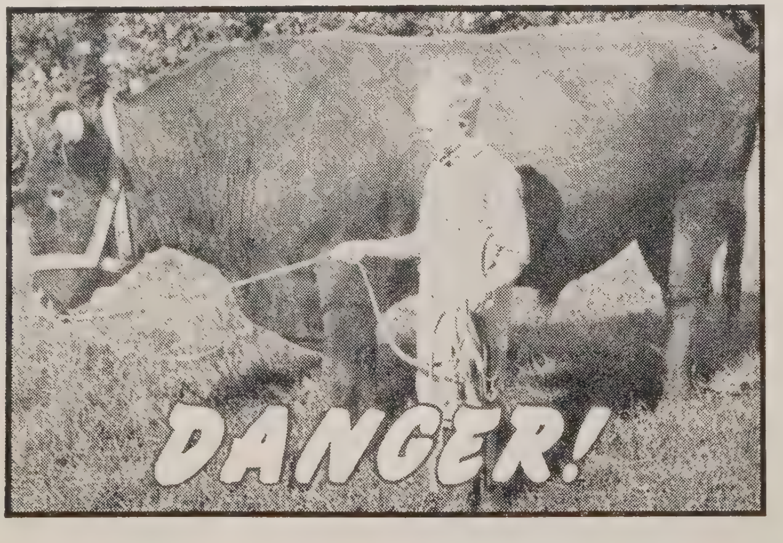
The different parts must be correctly wired together so that the motor and heating elements switch on and off together. There would be a real danger if the motor and fan stopped while the heating elements were still going, but it has been found that there is no need to keep the fan going after the heating elements have cut off.

Supers of honey are brought into the warming room from the apiary and stacked on drip trays, leaving about 4 or 5in. between each pile. There appears to be no need to stagger the supers, but air space between the piles is essential. Leave a little space around the door for the heating unit.

The grid end of the wind tube should face an aisle in the supers. Switch on the unit and close the door. It is best to have the switch and plug connection inside the warming room.

Experience has shown that when the unit has brought the temperature up to approximately 85 to 90 degrees F. it will cut off for 20 to 25 minutes and then run for about 10 minutes before cutting out again, but the times will of course be governed by the efficiency of the insulation of the warming room.

The amount of electricity used by such a unit is slightly more than 2 units per hour.



THOUGH bulls are recognised as the most dangerous of farm animals, they continue to take their toll of human life. The obviously dangerous bull of the bellowing, sod-throwing type is not the one responsible for these fatalities, for he is respected and every precaution is taken when he is handled. Rather is it the "quiet" type of bull that causes the accidents, for usually he is treated with the indifference arising from years of association with what is regarded as a docile animal. Since official statistics have been recorded in New Zealand, in only 2 years have bulls failed to add at least one to the total of farm fatalities, and twice they have been responsible for four deaths in 1 year. In all, 15 farmers have been killed by bulls in the past 10 years, with undoubtedly a large but unrecorded number of cases in which accidents were not fatal.

Never take risks with any bull, whatever his breed and disposition. Quiet ones are the worst, for bulls that advertise their dislike of the human race are naturally avoided.

—C. J. CROSBIE, Farm Machinery Instructor,
Department of Agriculture, Christchurch.

BOOK REVIEW

"Farm Wood Crops": J. F. Preston

THE publication of this book (302 pages) in the American Forestry Series will assure it of acceptance by professional foresters. It should be of interest to many farmers in the Dominion who have developed tree plantations more or less comparable with the "woodlots" of their American contemporaries.

In the present timber shortage the increasing necessity for the economic utilisation of farm-grown timber by the farmer together with the rising value in the next decade of selected, well-grown trees should make the farmer-owner realise the place that well-managed tree crops can hold in the general economy of farming. This point is discussed in the opening chapters of "Farm Wood Crops", where the national aspects of farm tree planting are pointed out in respect to land protection and best land use. Also stated are the general principles involved in the potential financial values of farm woodlots. These values are demonstrated in relation to labour use and general improvement of the farm land (shelter, amenity, and timber products). All these points apply in the present stage of farm planting in New Zealand, which may be aptly described in the author's words on page 17 of his book where he says ". . . the farmer . . . may do a poor job and get almost nothing in return or he may do a good job and get a very satisfactory return".

Much technical information on the formation and treatment of farm plantations is given in a style readable by and interesting to the layman, and New Zealand farm tree planters would have light thrown on their plantation management problems by a perusal of Chapter 9, "Practices on Farm Woodlands", and also from an interesting and up-to-date section on methods of wood preservation given in Chapter 11.

The appendix includes a glossary, extracts from U.S.A. legislative measures relevant to farm forestry development, an efficient index, but no list of illustrations. The book is well illustrated by good photographs and diagrams, is clearly printed, and the general layout is attractive and enhanced by the clear and efficient arrangement of headings and subheadings.

—M.S.

McGraw-Hill Book Co., Inc., New York.

POISONOUS PLANTS IN NEW ZEALAND

HERBIVOROUS animals on free range indulge a wide and varied taste in the plants they eat as fodder. Their taste, however, does not always lead them to distinguish between plants that are safe and useful as fodder and plants that are poisonous. Many plant associations include at least some species injurious to stock, and in consequence grazing animals are often exposed to the risk of harm from eating these species. The risk is greater when animals range over large tracts of land on which the herbage is subjected to very little control by man, and is increased still further when the native flora includes a large number of poisonous plants. As more restraint is placed on the animals by subdivision of the grazing areas, and, particularly, as the herbage itself is controlled by the planting of desirable pasture species and by intensive care and management of the crops, so does the risk of poisoning by plants become correspondingly reduced.

THIS article introduces a series of descriptions of poisonous plants which grow in New Zealand by H. E. Connor, Botanist, Department of Scientific and Industrial Research, Wellington. They will be accompanied by 26 illustrations. Readers who are likely to find the series of interest should retain the glossaries printed in this issue for use with the descriptions and illustrations of plants to appear in subsequent issues of the "Journal".

Among farming countries of the world New Zealand is relatively fortunate in the number of stock lost from poisoning by plants. A considerable proportion of the stock is grazed under a system of intensive management which normally keeps the pastures free from invasion by toxic plants. The remaining stock on the relatively extensively managed hill country and on the extensively managed highlands are not exposed to as great a number of poisonous native species as are those in some other lands. Losses from plant poisoning are nevertheless appreciable and constitute a steady, if small, drain on the resources of the farming industry and on the profits of the individual farmer. Even intensive management of pasture may sometimes fail to give protection against invasion by toxic plants: For example, heavy growths of the poisonous variegated thistle may occur in pasture swards debilitated by drought; adverse weather may temporarily change pasture to a toxic state capable of producing facial eczema in stock; on extensively managed areas introduced ragwort has become established and presents a difficult problem of control; and the native tutu still exacts its toll of animal life.

This series of articles comprises part of a very full and detailed survey of the known poisonous plants, both native and introduced, that occur in New Zealand. Information has been gathered from many sources—from personal observations, from the records in the archives of Government Departments, and from the published literature of New Zealand and of countries overseas. Added value has been given by the co-operation of numerous men in the field—Government Veterinarians, Instructors in Agriculture, and Inspectors of Stock—who have supplied particulars of the distribution of poisonous plants and of symptoms and the incidence of stock poisoning in their districts. Analysis of such data supplied in answer to a questionnaire has been in itself a not inconsiderable task. No information was available about the effects of many native plants on animals, and experimental feeding work on samples collected by the author was carried out at the Department of Agriculture Animal Research Station, Wallaceville. The result is a valuable contribution to knowledge of poisonous plants. It is a comprehensive reference to which to turn when stock losses have occurred, but, still more important, it can be of signal value in preventing loss of stock. In general, avoiding loss entails preventing access of stock to poisonous plants. It means eradication and destruction of poisonous plants, fencing off of areas growing toxic plants, and careful disposal of poisonous clippings or trimmings. For all such work recognition of poisonous plants is a necessary preliminary: the descriptions and illustrations in these articles will enable such knowledge to be acquired. Only when the information is used to prevent stock losses will it achieve its purpose fully.

—*I. J. CUNNINGHAM, Superintendent,*
Department of Agriculture Animal
Research Station, Wallaceville.

Grazing stock cannot be trusted to distinguish between safe and poisonous plants.

GLOSSARY OF BOTANICAL TERMS

A

Achene—A small, dry, hard, indehiscent, one-seeded fruit, as in buttercups.

Acuminate—Having a gradually diminishing point.

Acute—Sharply pointed.

Annual—Life cycle completed in 1 year.

Auricle—A small lobe, an appendage to a leaf; hence auriculated.

Awn—A bristle-like appendage, as on the glumes and lemmas of grasses.

Axillary—Occurring in the axil, as between stem and leaf.

B

Berry—A pulpy fruit with immersed seeds.

Biennial—Flowering and dying in the second year.

Bulb—A short root stock, with the buds covered by fleshy leaf scales.

C

Calyx—The outer floral envelope, sepals.

Campanulate—Bell shaped, as of a corolla.

Capsule—Dry, dehiscent fruit.

Cordate—Broadly notched at the base, as of petals and leaves.

Corolla—The inner floral envelope, petals.

Corymb—An inflorescence with flowers arising at different levels to form a flattish top; hence corymbose.

Crenate—Scalloped, or with rounded teeth, as of leaves.

Culm—The stalk of sedges and grasses.

Cuneate—Wedge shaped, as of leaves, petals, sepals.

Cupule—The cup of such fruits as an acorn; hence cupular.

D

Deciduous—Falling after completion of function, as of leaves.

Decompound—Much divided, as of leaves.

Decumbent—Prostrate with ascending tips, as of stems.

Deflexed—Bent downward, as of sepals.

Dentate—Toothed, with the teeth outwardly directed, as of leaves.

Disc—The central part of the head in composite flowers, on which the disc florets are situated. The receptacle.

Drupe—A fruit of three layers, an outer skin, a fleshy layer, and a hard inner layer, as in a plum.

E

Elliptic—Oblong with regularly rounded ends, as of leaves.

Emarginate—Notched at the free end, as of leaves.

Ensiform—Sword shaped, as of leaves.

F

Falcate—Sickle shaped, as of leaves.

Filiform—Thread-like, as of florets in *Compositae*.

Flexuous—Bent in a zigzag or wavy fashion.

Floret—A small flower, as of *Compositae*.

Follicle—A fruit of one carpel, opening along the inner margin, as of delphinium.

G

Glabrate—Lacking pubescence, or nearly so; hence glabrous.

Glaucous—Covered with bluish bloom, as of leaves.

Globose—Nearly spherical.

Glume—Chaffy outer scale in the spikelets of grasses.

H

Hermaphrodite—Both sexes in one flower.

I

Imbricate—Overlapping, as of leaves or floral parts.

Inflorescence—The flowering portion of a plant.

Involucre—A series of bracts surrounding a group of flowers or their stalks, as of *Compositae*; hence involucral.

L

Lamina—Blade of leaf.

Lanceolate—Tapering toward each end, with the greatest breadth about one-third way up, as of leaves.

Lemma—The outer husk of a grass floret.

Lenticel—A corky spot on young bark, as in elder.

Ligule—
- (a) The strap-shaped floret in *Compositae*; hence ligulate.
- (b) The projecting portion at the junction of sheath and blade in grasses.

Linear—Narrow, several times longer than wide, as of leaves.

Lyrate—Pinnately lobed, with a large terminal lobe and smaller lower lobes; hence lyrato-pinnatifid.

M

Membranous—Very thin, more or less translucent, as of leaves.

Mucronate—Sharply pointed, as of leaves.

Mycelium—The vegetative portion of a fungus; hence mycelial.

N

Node—The place of insertion of a leaf or leaves.

Nut—A hard, indehiscent, one-seeded fruit.

O

Oblanceolate—As for lanceolate, but the widest part in the upper third.

Obovate—Reversed ovate, widest part toward the apex, as of leaves.

Obtuse—Rounded at the apex, as of leaves.

Orbicular—Circular or nearly so in outline, as of leaves.

Ovate—Egg shaped in outline, the broad part at the base.

Ovoid—Egg shaped, as of fruits.

P

Palmate—Lobed in the manner of the fingers of an open hand, as of leaves.

Panicle—An indeterminate inflorescence, in which the axis divides several times; hence paniculate.

Papillose—Covered with soft, superficial glands or protruberances.

Partite—Divided, but not quite to the base, as of leaves.

Pedicel—Supporting stalk of a single flower, as in a compound inflorescence.

Peduncle—The stalk of a flower or a cluster of flowers.

Pendulous—Hanging.

Perennial—Lasting several years, as opposed to annual or biennial.

Perianth—The floral envelope; usually applied when the calyx and corolla are similar, or one is absent.

Petiole—Stalk of a leaf.

Phyllary—An individual bract of the involucre of a composite flower head.

Pilose—Hairy.

Pinna—Leaflet of a pinnate leaf; hence pinnate, pinnately.

Pinnatifid—Pinnately cut half-way to midrib, as of a leaf.

Pinnatisect—Pinnately cut down to midrib.

Procumbent—Laying along the ground, as of stems.

Prostrate—Flattened to the ground, as of stems.

Puberulous—Slightly hairy.

Pubescent—Clad in soft, short hair.

R

Raceme—Indeterminate inflorescence, with primary axis bearing pedicelled flowers.

Radical—Arising from the crown of root stock, as of leaves.

Ray—A ligulate marginal floret as in *Compositae*.

Receptacle—The part of the floral axis bearing the envelopes and sexual organs.

Recurved—Bent backward.

Rhizome—A spreading underground stem.

Rhomboid—Lozenge shaped; hence rhomboidal, as of leaves.

Rotate—Of a corolla with a very short tube and regular, spreading lobes.

S

Scabrid—Rough to touch, as of leaves.

Scape—Radical, leafless, floral axis or peduncle.

Sclerotium—Fruiting body of a fungus, as of ergot.

Serrate—With sharp, forward-pointing teeth, as of leaves.

Sessile—Lacking a stalk, as of leaves.

Sinuate—With a wavy margin, as of leaves.

Sori—Asexual reproductive organs of ferns.

Spathe—A large bract enclosing a flower cluster, as of monocotyledons.

Spathulate—Oblong with base drawn out like a spathula.

Spikelets—The separate flower clusters in grasses and sedges.

Spine—A sharply pointed woody organ; hence spinose.

Stellate—Star shaped, as of hairs with radiating branches.

Stipe—The leaf stalk of a fern.

Stipule—An appendage to a leaf at or near its insertion on the stem.

Stolon—A spreading and rooting overground stem; hence stoloniferous.

Striate—Masked with fine parallel lines, as of leaves.

Sub—Prefix meaning somewhat; hence subprostrate, subacute, suberect, subsessile, subcompressed, subpaniculate, suborbicular, subglobose.

Subulate—Awl shaped, as of petals and sepals.

Succulent—Juicy.

T

Tendril—Modification of a leaf or stem acting as a climbing organ, as in sweet peas.

Tepal—A member of a floral envelope in which sepals and petals are similar or not clearly distinguishable, as of *Polygonaceae*.

Terete—Circular in section.

Tomentum—A dense covering of woolly, matted hairs; hence tomentose.

Trifid—Three cleft.

Trifoliate—Three leaved.

Trigonous—Three angled, as of culms in some sedges.

Tripinnate—Three pinnate.

Truncate—Ending abruptly, as if cut off.

Tunicate—Having coats or tunics.

U

Umbel—An inflorescence with a cluster of pedicels arising at the same point; hence umbellate.

Undulate—Wavy, as of margins of leaves.

Unisexual—One sex present in flower.

Utricle—A membranous covering to the fruit, as in *Carex*.

V

Villous—With long weak hairs.

W

Whorled—Organs arranged in a circle around the axis.

Poisonous Plant Defined

In general terms, a poisonous plant is one which when eaten by animals exerts harmful effects or produces death because of its toxic substances.

Types of Poisoning

Sublethal: Produces a condition of debility or sickness.

Lethal: Produces death.

The word toxic is used broadly to cover, in some cases, both sublethal and lethal.

Classification of Poisonous Plants

Of the methods available for the classification of poisonous plants the most commonly used are:—

1. Natural grouping of plants into families.
2. Nature of the toxin—for example, alkaloid or glycoside.
3. Physiological action of the toxin—for example, irritants or blood poisons.
4. Part of the plant eaten.

Of these four the botanical method of separating the plants into families is the most readily applicable, as it avoids the overlapping which occurs if any of the other methods are employed. This botanical type of classification is used in this series.

Poisonous Principles

The poisonous plants of New Zealand contain toxins which are recognised all over the world as causatives of poisonings. There are five main categories:—

1. **Alkaloids**, which are complex nitrogenous substances synthesised by plants. They are not all toxic. Some of the plant families which contain alkaloids are *Papaveraceae*, *Monimiaceae*, *Solanaceae*, *Papilionaceae*, and *Compositae*.

2. **Glycosides**, which yield on hydrolysis sugars and one or more other substances, the aglycones.

(a) **Cyanogenetic glycosides:** These substances liberate hydrocyanic (prussic) acid (HCN) in the presence of a suitable enzyme. Crushing of leaves may be sufficient to bring the enzyme and the glycoside into contact. Two of the plants containing cyanogenetic glycosides which grow in New Zealand are linen flax (*Linum usitatissimum*) and titoki (*Alectryon excelsum*).

(b) **Other glycosides:** Two plants containing glycosides are foxglove (*Digitalis purpurea*) and karaka (*Corynocarpus laevigata*). Saponins are present in some poisonous plants, but their toxicity is not pronounced. Mustard-oil glycosides are to be found in members of the *Cruciferae*.

3. **Photodynamic substances**, which occur in plants which cause photosensitivity—for example, St. John's wort (*Hypericum perforatum*).

4. **Inorganic compounds:** Nitrates accumulated by plants may be broken down by bacterial or enzyme action into toxic nitrites. Plants associated with this type of toxin are mangolds (*Beta vulgaris* var. *rapa*), hay made from oats (*Avena sativa*), and variegated thistle (*Silybum marianum*).

5. **Other substances:** Tutin present in tutu (*Coriaria arborea*) is a picrotoxin-like substance. Oxalic acid is the toxin present in such plants as sour dock (*Rumex acetosa*) and Bermuda buttercup (*Oxalis cernua*). False acacia (*Robinia pseudacacia*) and castor-oil plant (*Ricinus communis*) contain phytotoxins.

Physiological Action of the Poisonous Principle

1. **Blood poisons:** Castor-oil plant (*Ricinus communis*) and false acacia (*Robinia pseudacacia*).

2. **Neurotic poisons:** Opium poppy (*Papaver somniferum*), and henbane (*Hyoscyamus niger*).

3. **Neuro-muscular poisons:** Foxglove (*Digitalis purpurea*).

4. **Irritants:** *Brassica* species and *Ranunculus* species.

Conditions Influencing Plant Poisoning

There are characteristic well-known conditions of plant poisoning; these are mentioned throughout the series where they occur specially, but are generalised here to serve as a guide:—

Condition of the Plant

Part of the plant: A specialised part of the plant may be poisonous while the remainder when eaten will cause no toxic effects, or some part of the plant may be more toxic than any other part. The poisonous properties of some crucifers are restricted to the seeds, and there is an accumulation of toxic amounts of alkaloid in the seeds of some *Leguminosae*. Karaka is a well-known instance in which the kernels of the drupes are the only poisonous part of the plant and only when they are eaten fresh or raw.

Stage of growth: Into this group falls the example afforded by poroporo (*Solanum aviculare*), of which the green berries are poisonous and the ripe berries are not. Some buttercups (*Ranunculus* spp.) increase in toxicity up to flowering time, when they are most toxic, and decrease in toxicity after maturation.

Soil conditions: The presence in the soil of quantities of the selenium which is absorbed by certain plants leads to poisonings in certain parts of the United States of America. Some plants—for example, variegated thistle (*Silybum marianum*)—cause poisonings by the quantity of nitrate absorbed from the soil. Lantana (*Lantana camara*) is known to vary in toxicity with soil changes, as in Australia.

Condition of the Animal

Travelling stock are those most frequently poisoned, as they are forced by circumstances to eat plants to which they are not accustomed or to eat more than they might normally. The rapid absorption of the toxins in an empty stomach may be the cause of the frequent poisonings in hungry stock.

Symptoms of poisoning which develop only when animals are forced to move are exhibited after the consumption of such plants as mallow (*Malva parviflora*) and woundwort (*Stachys arvensis*).

Animals with white skins or weakly pigmented areas of skin develop photosensitivity diseases after eating plants which contain photodynamic substances. When the animals are subjected to light, photosensitivity diseases result. The external symptoms of these diseases are not seen in stock with black or heavily pigmented skin.

One of the vagaries of domestic animals is the eating of cuttings or clippings of plants which they might not eat during normal foraging.

Glossaries and Synopsis

Glossaries of botanical and veterinary terms used in this series appear on pages 318 and 320 and should be used for reference during the currency of the series in the "Journal". They should be of assistance in both the use of the botanical descriptions and in the discussion of symptoms of poisoning.

The place name at the end of a botanical description indicates the country of origin.

A synopsis of the grouping of the plants into three classes and a classification of the plants mentioned in the text into trees, herbs, and shrubs will be published at the end of the series.

Acknowledgments

In addition to the assistance of officers of the Department of Agriculture previously mentioned, others whose work is acknowledged are staff of the Botany Division of the Department of Scientific and Industrial Research and C. W. Brandt of the Dominion Laboratory.

Reference List

Following is a list of the main texts and papers on poisonous plants in New Zealand. Constant use has been made of these publications in the preparation of the text and they may be used with advantage in association with this series of articles:—

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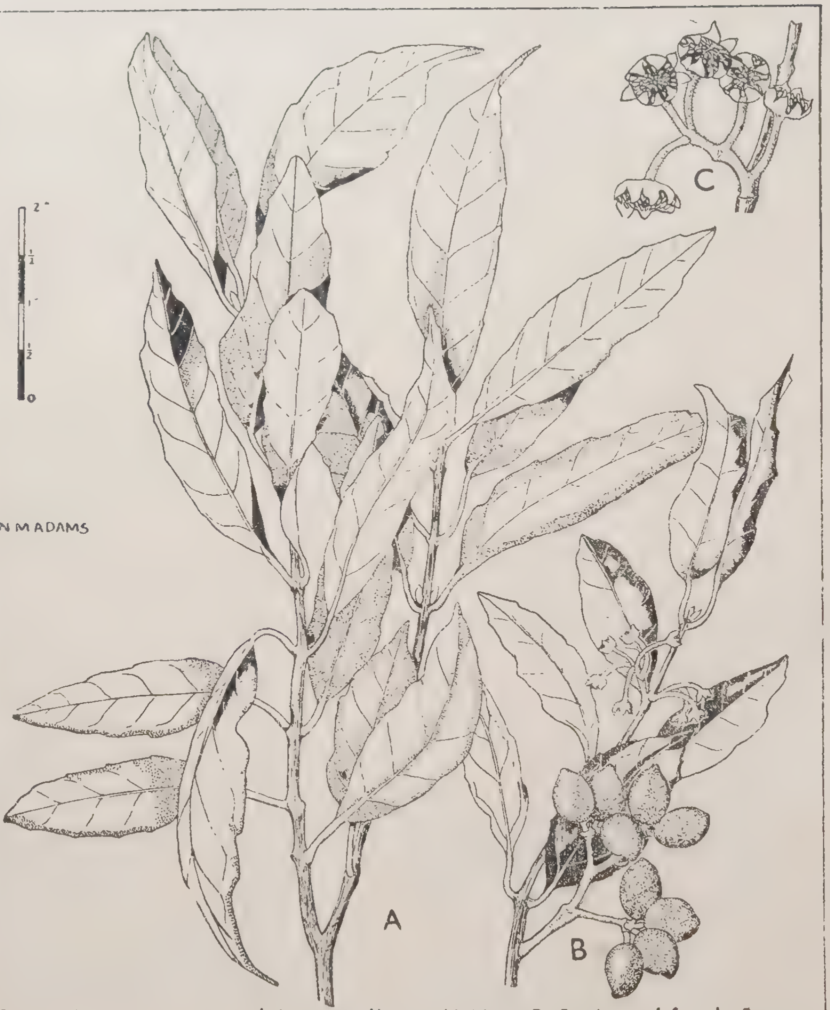


Fig. 1—*Hedycarya arborea* (pigeonwood). A: Habit. B: Berries and female flowers. C: Raceme of male flowers.

DICOTYLEDONS

Monimiaceae

Pigeonwood. Porokaiwhiri. *Hedycarya arborea.* **Forst. (Fig. 1)**

Botanical description: Habit—Small tree 20 to 40ft. high; trunk up to 20in. in diameter. **Leaves**—Opposite, 2 to 5in. long, coarsely toothed, tough, dark green above and paler beneath. **Flowers**—Small, in clusters, white-green in colour. **Fruit**—Drupes, clustered, fleshy, turning bright red when ripe, ½in. long. (New Zealand.)

Habitat: Throughout bush and around bush edges.

Distribution: Abundant from North Cape to Banks Peninsula and Milford Sound. Sea level to 2500ft.

General: In feeding trials conducted at the Animal Research Station, Wallaceville, pigeonwood has proved to be lethal to sheep and non-lethal to cattle. It was originally reported as a suspect in a case in which several cows were poisoned fatally. On the basis of field observations, one investigator pronounces pigeonwood to be palatable to sheep, which were found to have grazed on young plants. No mention was made of toxicity. The plant material used in the feeding trials was collected from adult plants which possibly are more poisonous than the juvenile ones. The adult plant foliage is not normally accessible to stock, but the leaves of immature plants may be; storms may make adult foliage available by breaking down branches.

Symptoms of poisoning: Experimental cases showed that in sheep there was dullness, anorexia, and loss of weight. No marked post-mortem lesions were visible. In a cow there was loss of appetite and a good deal of depression; on post-mortem examination no changes were visible.

Poisonous principle: The presence of an alkaloid in the plant is indicated by chemical methods.

GLOSSARY OF VETERINARY TERMS

A
Abomasum—The fourth stomach of a ruminant.
Anorexia—Absence or loss of appetite.
Asphyxiation—Suffocation.
Ataxia—Loss of power of muscular co-ordination.
Atrophied—Diminished in size and function; wasted.

B
Blind gut—The caecum.
Buccal—Relating to the cheek.

C
Caecum—Blind gut on part of the alimentary canal.
Catarrh—Inflammation of the mucous membrane.
Cathartic—Purgative.
Chorea—Involuntary muscular twitching.
Cirrhosis—Hardening of tissue.
Clonic—Related to convulsions marked by alternate rigidity and relaxation of the muscles.
Colic—Acute pain in the stomach.
Coma—Stupor; abnormally deep sleep.
Congestion—Abnormal accumulation of blood in a part of the body.
Conjunctiva—Membrane lining of the eyelid.
Cyanosis—Bluish or purplish discoloration of the skin and mucous membrane.

D
Dermatitis—Inflammation of the skin.
Diuretic—A medium increasing the flow of urine.
Dyspnoea—Difficult breathing.

E
Eczema—An inflammatory condition of the skin.
Emaciation—A wasted condition of the body.
Emesis—Vomiting.
Enteritis—Inflammation of the intestine.
Enuresis—Involuntary passing of urine.
Epileptiform—Recurring in severe and sudden paroxysms.

G
Gangrene—Death and putrefaction of a part.
Gastro-enteritis—Inflammation of the stomach and intestines.

H
Haematuria—Red blood cells in urine.
Haemoglobin—Red colouring matter of blood.
Haemoglobinuria—Blood colouring matter in urine.
Haemorrhagic—Bleeding.
Hoven—Bloat.
Hyperaemia—Congestion. Excess of blood in any part of the body.

I
Icterus—See jaundice; hence icteric.

J
Jaundice—Yellowness of the skin, fluids, and tissues caused by presence of the bile pigments.

L
Lactation—The secretion of milk.

M
Methaemoglobin—A product of the oxidation of blood colouring matter.
Mucosa—Mucous membrane.
Mucous—Relating to mucus.
Mucus—Slimy substance secreted by the glands of the mucous membrane.

N
Narcotic—A drug which produces sleep or stupor, thereby relieving pain.
Nausea—Feeling of sickness.
Necrosis—Death of a group or groups of cells
Nephritis—Inflammation of the kidney.

O
Oedema—Swelling produced by large quantities of fluid in the tissues.

P
Paroxysm—A fit. A recurrence or intensification of symptoms.
Peritoneum—Membrane lining the abdominal cavity; hence peritoneal, peritonitis.
Photosensitivity—Sensitive to light; hence photosensitisation.
Pleura—The serous membrane lining the thoracic cavity and covering the lung.

R
Rectum—Terminal portion of the digestive tube.
Rumen—Paunch of a ruminant.

S
Salivation—Production of unusual secretion of saliva.
Serosa—Serous membrane.
Stertorous—Characterised by snoring

T
Tetany—Spasm of many or all voluntary muscles.
Trifoliosis—Disease produced by *Trifolium* species.
Tympanites—Distension of the abdomen by gas

U
Ulceration—Open sore other than a wound

V
Venous—Applied to blood returning to the heart after circulation in the body.
Vesicatory—Causing blisters.
Viscera—The internal organs contained in various parts of the body.

Control of Diseases and Insect Pests in the Vineyard

By F. BERRY SMITH, Viticulturist,
Department of Agriculture,
Auckland.

IN common with other plants grown for commercial purposes the grapevine is subject to attack from a number of diseases and insect pests and a knowledge of them and of the specific control measures to apply is most essential for successful culture. This article describes the characteristics of the various diseases and insect pests of the vine which exist in New Zealand and prescribes measures for control.

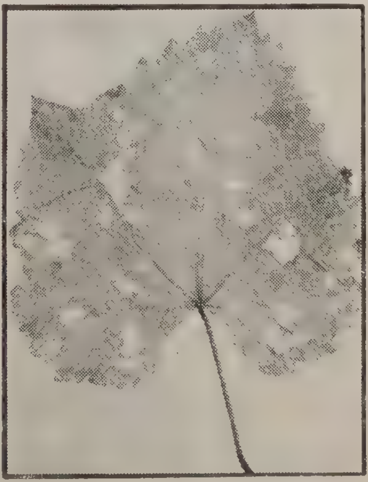
THE degree of immunity to troubles varies with the variety of vine and its constitutional health. In general, American vines, especially those close to the elemental species such as are used for phylloxera-resistant stock, are somewhat more resistant than European varieties, but individual varieties of both types show considerable variation in this respect. The resistance of most of the hybrid types depends largely on the ratio of American to European parentage in the cross and upon the individual resistance of the varieties involved. Two of the commonest fungous diseases, oidium and downy mildew, are indigenous to America; it is understandable, therefore, that American vine types have acquired a certain degree of immunity to them. Phylloxera, the insect most destructive to European vines, also originated in America and many American varieties are completely immune to serious injury from this pest.

Both weak growth and soft, rank growth are less resistant to damage from fungous diseases and insects than strong, normal growth. A weakened condition of the vine may result from several causes—excessive cropping, inadequate or faulty nutrition, poor drainage, a too-acid or too-alkaline state of the soil, etc. Soft, rank growth is likely to occur in rich, moist soils having an abundant supply of nitrogen; such soils are often deficient in potash and phosphate, so that nutrition is unbalanced.

Another factor conducive to disease is poor air circulation in the vineyard, which produces pockets of stagnant, humid air and delayed drying of the foliage and fruit after rain. Proper trellising and training of the growth to prevent congestion, improve air circulation, and facilitate penetration of sprays was dealt with in the article "Trellising and Pruning Grape Vines", which appeared in the July, 1948, issue of the "Journal". Unrestricted weed growth beneath the trellis, which impedes ground draught, and a too-dense shelter belt also result in poor circulation of air. The maintaining of the vineyard free of weeds during the growing period of the vine also helps in the reduction of insect pests.

It is important to remember that good general management of the vineyard, which includes observing the precautions already outlined, plays an important part, in conjunction with spraying, in achieving satisfactory control of disease and insect pests.

In spraying for control of disease it should be remembered that the action is more valuable as a preventive than as a curative, for once the fungus mycelium has entered the tissues of the vine it is beyond reach of fungicides.



Downy mildew on the under side of a leaf.

All fungous diseases of the vine are encouraged by warm, moist conditions. In Auckland and areas north of Auckland these conditions prevail to a considerable extent in most seasons and to achieve effective control spraying has to be done at 2-weekly intervals at least throughout most of the growing period. This frequent spraying is necessary to put a protective covering of fungicide on the new growth the vine is continually making and to replace previous spray deposits washed off by rain. In Hawkes Bay and other parts with a less humid climate fungous diseases are not so prevalent.

The action of a fungicide is to destroy the spores or "seed" of a fungus before or soon after germination and thereby prevent the germinating tube from gaining entry into the tissues of the vine. The efficiency of a spray depends mainly on the completeness with which all the herbaceous or green parts of the vine are covered, and for mature, vigorous vines in full foliage about 100 gallons of spray per acre is needed to do a thorough job.

Fungous Diseases

Downy Mildew

Downy mildew appears first on the upper surface of the leaf as a discoloured, irregular patch of slightly paler and more transparent hue than the rest of the leaf; hence the French term for it "oil spots." Downy mildew also attacks growing shoots and bunches.

In moist conditions the under surface of the patch becomes covered with a dense white down. This is rarely seen on the upper surface of the leaves and not often on the shoots or flowers, but it is not unusual for the fungus to attack the fruit. If berries are attacked early in the season, the flesh

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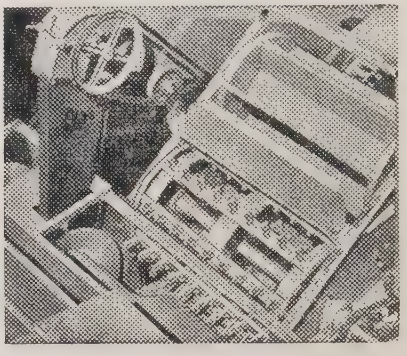

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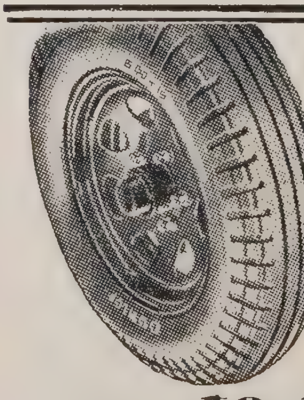

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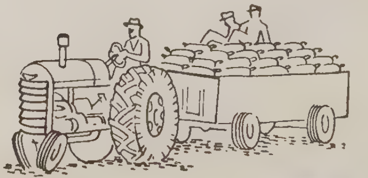

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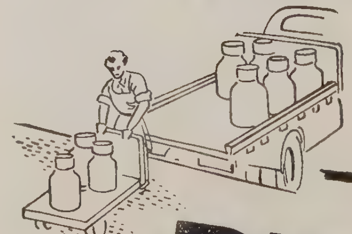

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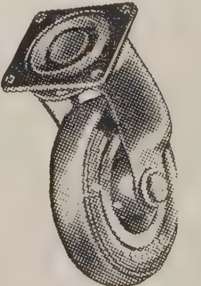

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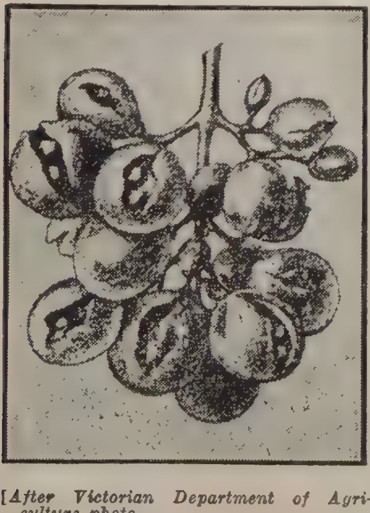
[After N.Y. State Agricultural Experimental Station photo.

Vine defoliated by the fungous disease downy mildew.

has a greyish-white appearance and later dries up. This form of the disease has been termed grey rot or bunch mildew. If the attack occurs when the fruit is further advanced, berries become discoloured—a dull red—soften, and fail to ripen. The disease in this form has been termed brown rot. When berries begin to change colour the fungus does not attack them.

Leaves are most subject to attack and even in a mild case the crop suffers indirectly, because the functions of the leaves are disordered. Downy mildew can be responsible for premature leaf fall, which, when serious, will prevent the fruit from ripening, as the sugar is manufactured in the leaves before it is transferred to the berries. The vigour of the vine is also seriously affected, as leaves serve to ripen the canes and manufacture foodstuffs for nourishment and storage in the vine for a healthy start the following spring. Warm, wet conditions favour the development of downy mildew and under these circumstances it is able to spread with extreme rapidity, even from a small source of infection.



[After Victorian Department of Agriculture photo.

Immature berries split by oidium.

Control: Spraying with Bordeaux mixture is the most widely used and generally satisfactory method of controlling downy mildew. Many other copper-containing spray compounds have been tried. but none has been sufficiently good to replace Bordeaux, which is usually used at a strength of 5 : 4 : 50. Overseas reports claim satisfactory results with 2 : 2 : 50 Bordeaux, and experiments conducted at the Department of Agriculture Horticultural Station, Te Kauwhata, support this opinion, provided coverage is thorough and application frequent. Use of dilute-strength sprays is particularly desirable with table varieties, where spray residues on fruit detract from the market value. The foliage of vines treated with dilute sprays, provided it is sufficiently strong to prevent disease, appears healthier than that on which stronger applications are used. The use of almost any spray will have a slightly depressing action and the ideal is to employ a strength no greater than is sufficient to control disease. On many varieties high-strength Bordeaux will cause scorching and hardening of the leaves. In areas of high rainfall or in a wet season it would be advisable to increase the strength of Bordeaux to 5 : 4 : 50 to counteract the greater loss of spray deposit from the foliage.

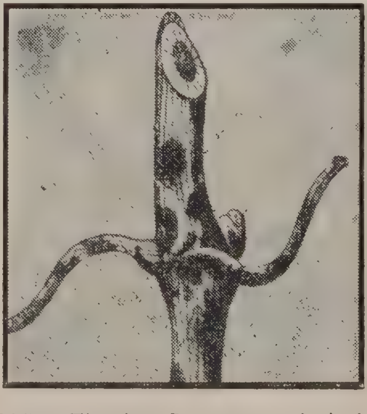
Oidium

Oidium, which is also known as powdery mildew, attacks all green, growing parts of vines, including the fruit, and appears as a very fine dusty film which gradually becomes greyish, with a typical mouldy smell.

Oidium is easily distinguished from downy mildew. Downy mildew appears as a white, glistening down which is confined to the under side of the leaf, whereas the dusty film of oidium is most noticeable on the glossy, upper side, though it may also be present below. Oidium patches gradually become darker—because of the formation of dark markings on the vine parts—as a result of injury by the fungus to the surface tissues. The black markings, which rather spoil the appearance of table grapes, also occur on the canes. The most severe damage occurs when the bunch is affected and if this happens before or shortly after flowering, the flowers and small developing fruit, which become covered with the mildew, soon dry up and drop off. When older fruit becomes mildewed skin growth is retarded and splitting usually occurs.

Warm, humid conditions favour the development of oidium; water is not necessary as is the case with black spot and downy mildew. Opening up the vine and redistributing the foliage to permit air to circulate freely, particularly with the more susceptible varieties, is thus important in discouraging oidium.

Control: Dusting vines with sulphur will give good control of oidium, if the



[After Victorian Department of Agriculture photo.

Black mottling of vine cane caused by oidium.

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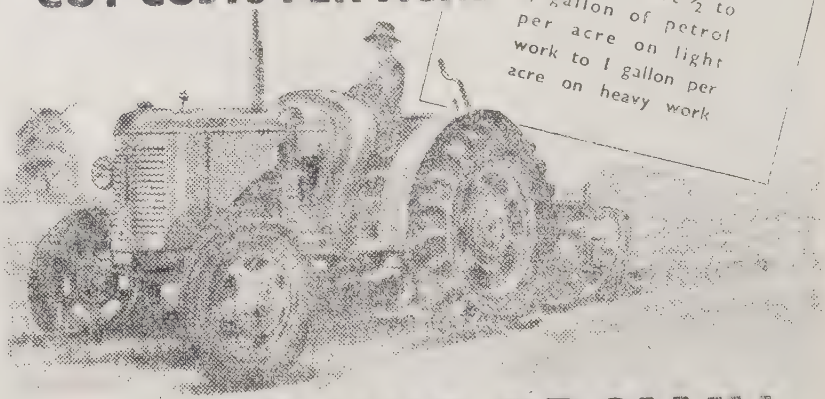

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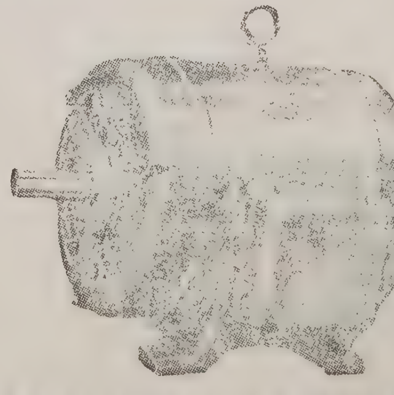

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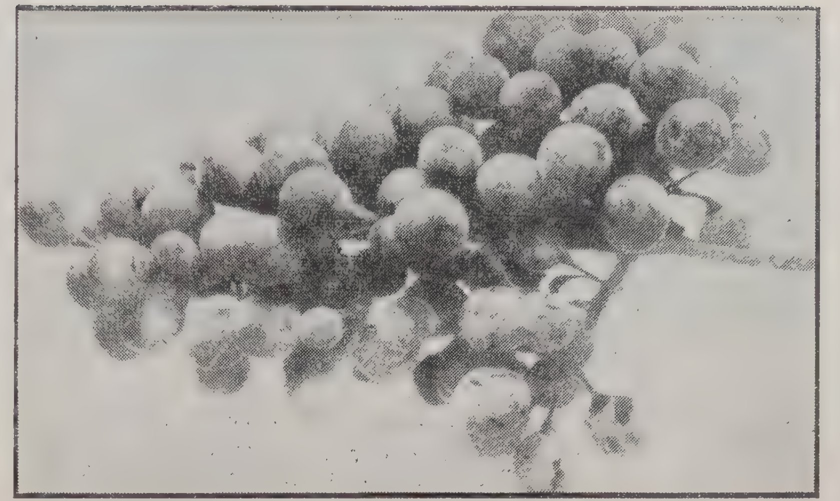
weather is warm enough to vaporise the sulphur, as it is the emanations which give it fungicidal properties. The addition of about one-fifth by volume of hydrated lime to the sulphur facilitates distribution and may possibly increase the efficiency of the dust through the formation of small quantities of calcium sulphides, which provide the active principle of lime-sulphur. Sulphur may be applied with a knapsack or power-driven dusting device, depending on the area of vineyard. The sulphur used should be in a very finely divided state, as coarser samples are not nearly as effective. More positive control of oidium may be achieved by using 1:200 lime-sulphur, with 2lb. of colloidal sulphur added per 100 gallons. This fungicide possesses an advantage over sulphur in that it does not depend on heat to promote its activity, but there is a likelihood of mild burn with some vine varieties. If the weather is cool or dull, there is little chance of the lime-sulphur injuring the foliage, but if conditions are clear and hot, the spray will often cause some damage. If the latter conditions prevail, it is preferable to delay spraying until late in the day, when the temperature has fallen appreciably. Sulphur may be used in the colloidal form and applied conveniently by mixing it in with the regular Bordeaux sprays. The usual rate is 2lb. of 50 per cent. colloidal sulphur per 100 gallons of spray.

At the Te Kauwhata Horticultural Station experiments were made to determine whether colloidal sulphur, at various concentrations, used with Bordeaux gave sufficient control of oidium to permit dispensing with independent applications of sulphur dust or lime-sulphur. The trials showed that colloidal sulphur was not nearly as efficient as either sulphur dust or lime-sulphur for controlling oidium. At higher concentrations colloidal sulphur caused foliage damage on a number of varieties, especially on some of the hybrids. The use of colloidal sulphur perhaps could be regarded as a contributory control measure.

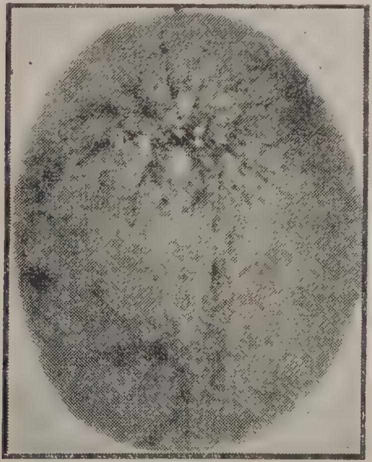
Black Spot or Anthracnose

Black spot or anthracnose appears on early spring growth and the most serious damage usually occurs before blossom time. When vines are badly attacked at this stage the result may be destruction of the embryonic bunches, which are reduced to blackened and withered fruit stalks. The young leaves, tendrils, and shoots develop black patches of dead tissue, which lead to stunting and distortion.

OIDIUM INFECTION OF GRAPES



A bunch of grapes infected with oidium or powdery mildew.



[*After Queensland Department of Agriculture photo.*

Berry showing dark markings left by oidium infection.

The most characteristic symptoms are seen in the lesions on the canes. These appear first as small dark-brown or black spots, eventually producing open, black scars.

When the berries are attacked later in the season the fungus forms slightly depressed, scaly spots, with a greyish-pink centre and a dark-brown to black margin.

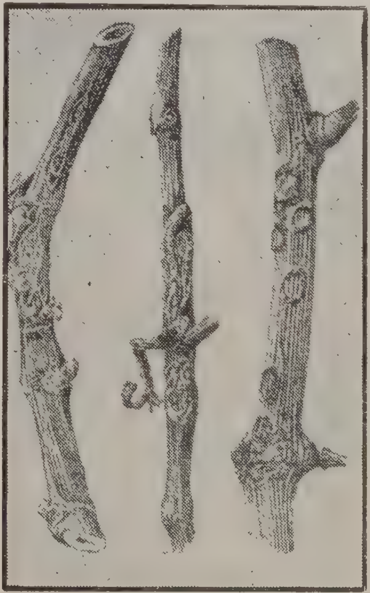
Moist conditions favour the spread of black spot. A wet spring or summer, even though the weather is rather cool, is conducive to the development of black spot, as if conditions are moist, the disease seems able to develop at lower temperatures than many other fungous diseases. Unlike downy mildew black spot is a slow-spreading disease.

Control: Anthracnose may be controlled with copper sprays, so that applications of Bordeaux will serve the dual purpose of affording protection against it as well as against downy mildew. The use of 1 in 10 lime-sulphur as a dormant spray just before bud burst is considered to be a contributory control measure for this as well as other fungous diseases and insect pests.

Botrytis Rot

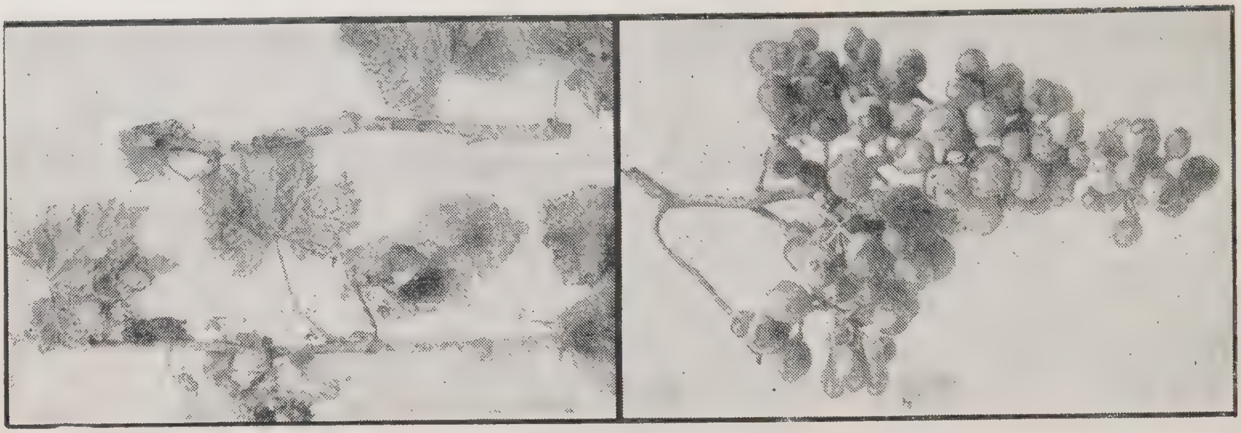
Botrytis rot is most likely to occur late in the season if the weather is wet and warm. It appears to commence on some of the ripe berries that have split naturally or been damaged by birds or insects. It can spread rapidly under suitable conditions, especially on varieties with tight bunches, which retain moisture. Infected bunches are covered with a felty mass of grey mould.

To achieve the best quality in wine the grapes used should have attained maximum maturity and for that reason it is desirable to defer picking until the correct stage is reached. However, deterioration of the fruit through the development of moulds sometimes makes premature harvesting necessary, unless some protective spray is applied. Where grapes reach maximum maturity aromatic substances and other principles which impart quality and character to wine are developed to the fullest extent. In addition the sugar content of mature fruit is higher and the acidity lower than in less mature fruit. These attributes are reflected in a smooth, pleasing wine. In contrast wine made from immature grapes is lacking in character and bouquet and has a sharp, objectionable acidity.



[*After Viala and Pacottet.*

Black spot on ripened wood.



Black spot infection on leaves (left) and immature grapes (right).

Control: Spray with lime-sulphur 1 : 150, plus a wetting agent.

Insect Pests

Grapevine Moth

(*Phalaenoides glycine*)

The caterpillars of the grapevine moth, which found its way to New Zealand from Australia in recent years, depredate vines by devouring the foliage and damaging the developing grapes.

Control: Include and apply arsenate of lead with Bordeaux spray at the rate of 1½lb. per 100 gallons of spray, or, alternatively, use 1lb. of 50 per cent. wettable D.D.T. (½lb. of actual D.D.T.) per 100 gallons of Bordeaux.

Leaf-roller Caterpillar

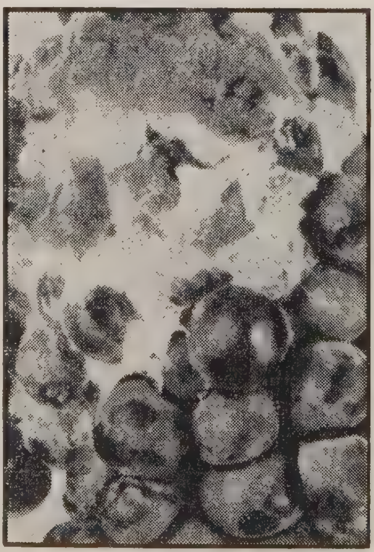
Leaf-roller caterpillars are small green caterpillars characterised by the manner in which they draw the vine leaves together by fine silken threads. They eat leaves and attack berries and fruit stalks at all stages of development; in ripe bunches the damage is usually followed by mould infection.

Control: As D.D.T. is not highly effective at ordinary dosages for the control of this pest, lead arsenate at the rate of 1½lb. per 100 gallons is probably the best treatment, though a new material, D.D.D., is likely to supersede lead arsenate and D.D.T.

Phylloxera (*Phylloxera vastatrix*)

The phylloxera insect is an aphis with a complicated life history; it spends most of its time infesting the roots as a tiny, yellowish, wingless, female louse about 1/25in. long. At this stage it multiplies without mating and swarms over the roots, sucking the sap and causing an irritation which produces bulbous, yellow, soft, watery swellings which eventually decay, destroying the roots. The insect, after a series of moults and changes, develops wings and flies away to other vines. There, on the under side of leaves, it lays eggs which hatch into males and females. These mate and the females deposit a winter egg on the bark of the older wood. In the spring these eggs hatch into wingless females and the young lice normally crawl up the canes to the leaves, where they puncture the upper surface, the irritation producing hollow galls which protrude on the under surface. In the galls the females multiply without mating for a number of generations, the last of which returns to the roots, where it continues the insidious attack.

Control: The only satisfactory and practical method of control is to graft susceptible varieties on to phylloxera-resistant root stock. Most fruiting varieties are destroyed by phylloxera if propagated on their own roots in infested areas. Notable exceptions are certain hybrid vines incorporating resistant wild American species. However, a number of the heavy-bearing hybrid varieties do not seem to possess sufficient resistance to flourish on their own roots. Only recently in the Henderson district the writer observed Seibel 5455 heavily infested with and seriously weakened by phylloxera. The most popular root stocks are *Riparia X Rupestris* 3306 and 3309, *Riparia X Berlandieri* 420A, and *Mouvedre X Rupestris* 1202.



[*After U.S. Department of Agriculture photo.*

Botrytis mould on ripe grapes.

All areas north of and including Tauranga are contaminated by phylloxera, but symptoms are seldom seen because most susceptible vines have been grafted on to resistant stocks. It is important to cut off any roots which may grow out of the scion or the resistant stock may die and render the vine vulnerable to attack.

Mealy Bugs

Mealy bugs rarely occur on outdoor vines in New Zealand, though they are very troublesome in glasshouse vineries. They are small, flat, torpid creatures which look as if they have been sprinkled with flour. They suck the sap from leaves and berries, leaving a sticky, sweet secretion on which a black, sooty fungus develops.

Control: The following spray has been used with reasonable success: Nicotine sulphate, 1 pint; summer oil emulsion, 1 gallon; water, 80 gallons. It destroys the bugs, but leaves a brown residue which spoils the appearance of table grapes, though it is of no consequence with wine grapes. Much better results have been obtained from a spray consisting of 1lb. of 50 per cent. wettable D.D.T. powder per 100 gallons of water or Bordeaux.

Thrips

Thrips are extremely tiny, dark, slender, active insects which are occasionally responsible for the failure of berries to set. They become active at the flowering period and, by infesting the flower stalk and sucking the sap, starve the embryonic berries, which atrophy and fall off. A most susceptible variety is Early Malingre, which otherwise can mature an excellent crop of high-quality wine grapes in New Zealand. Thrips can be detected by tapping a bunch at the flowering stage into the palm of the hand; if thrips are present this will dislodge myriads of them.

Control: The same sprays as for mealy bug should be used; D.D.T. is preferable.

Vine Mite

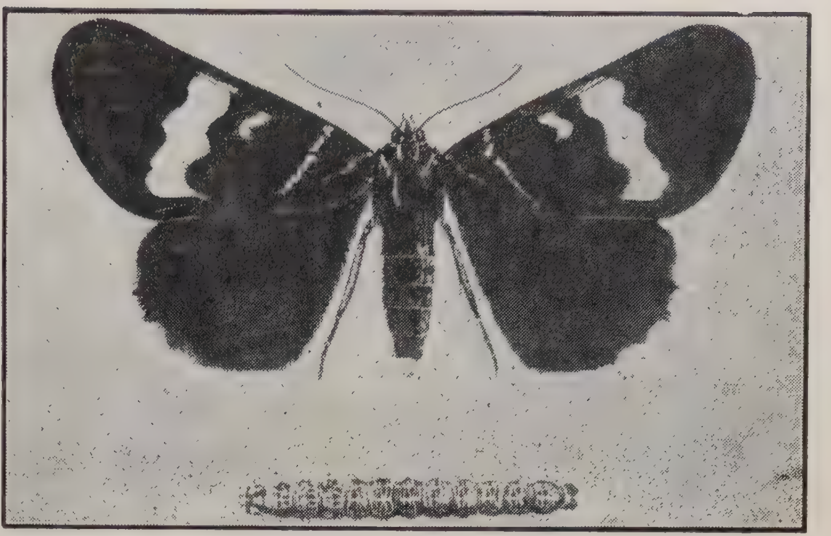
The vine mite is a microscopically small insect which punctures the lower surfaces of vine leaves and produces characteristic blisters on the upper surface, a condition known as erinose. Under these blisters, from where the leaves are punctured, a white felty mass of hairs is developed. Erinose is rarely serious to the vine or crop; it has sometimes been confused with downy mildew by untrained observers.

Control: Treatment should be the same as for powdery mildew. As the mite hibernates under bud scales, a 1 : 10 lime-sulphur spray at the dormant stage is an active deterrent.

Borers

The activity of borers is confined mainly to the older wood of the vine, where its presence is indicated by a gummy exudation and an accumulation of wood crumbs.

Control: It is often possible to destroy the insect by probing the tunnel it has made with a piece of baling wire. If the insect is beyond reach, it may be asphyxiated by inserting a cotton-wool plug saturated with petrol, kerosene, or carbon bisulphide in the borer hole. Another method is to inject one of these chemicals into the hole with an oil can and plug the opening with a piece of clay or grafting wax.



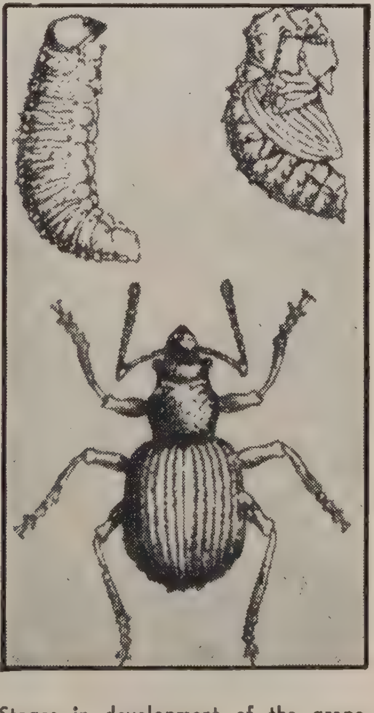
[After Given.

Grapevine moth and caterpillar. The moth, which measures about 2in. from tip to tip of expanded wings, has yellow markings on the forewings. The end of the abdomen and part of the legs are reddish. The caterpillar, which is about 2in. long when full grown, is greenish-yellow and patterned with black lines and spots. The head is yellowish and the hind end reddish.

Grapevine Weevil

The grapevine weevil can cause considerable damage by eating the leaves, shoots, and bunches. The beetles are very numerous when the growth is tender, but become less evident as the fruit and wood ripen or mature. Where stalks have been chewed the scars surrounded by dead tissue somewhat resemble—on casual observation—damage by black spot. As the beetles eat mainly at night and hide beneath old bark and twine and in other places during the day, they are not seen readily.

Control: Arsenate of lead or D.D.T. should be used as recommended for destruction of caterpillars.



Stages in development of the grapevine weevil. Upper left—Larva. Upper right—Chrysalis. Lower—Mature weevil (actual size 9mm.).

Root Eelworms

Instances of damage to vine roots by eelworms have been rare in New Zealand. The roots are penetrated by the nematodes, which cause swellings somewhat similar in appearance to those formed by phylloxera infestation, but usually much larger and softer. As the eelworms are about 1/100in. long, they can be seen only with a microscope. Excessive moisture and high soil temperatures favour the pest.

Control: Improved drainage will sometimes help. Injection of the soil with carbon bisulphide (½oz. per square yard) has been effective when done in October, as at this time eelworms are moving about in the ground. Some stocks such as *Riparia gloire* are fairly resistant to eelworms.

Brown Beetle

The brown beetle, which is about ½in. long is the adult of the New Zealand grass-grub. The beetle is on the wing at dusk during November and early December and is capable of causing considerable damage by feeding on the foliage of the vine.

Control: The same sprays as those used for grapevine moth should be employed.

Lecanid Scales

Lecanid scales are brown, elongated, oval structures up to a ¼in. long which adhere to the woody parts of the vine and live by sucking the sap. If sufficiently numerous, they will seriously debilitate the vines.

Control: Apply lime-sulphur 1 : 10 or winter oil 1 : 25 at the dormant stage. Vines in foliage may be sprayed with summer oil 1 : 100, if this treatment appears necessary, but the most effective treatment is to spray with winter oil at the dormant stage. The writer has never seen scale where lime-sulphur 1 : 10 is applied as a routine practice each year just before bud burst.

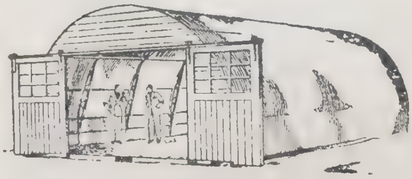
Degenerate Vines

Degeneracy is a physiological disease which may result from a complexity of causes, but in most cases continuous overcropping and improper nutrition are responsible. Affected vines weaken and die unless cultural methods are improved. In France a disorder similar to degeneracy, known as court noué, has reached serious proportions and intensive research work is in progress to remedy and prevent the trouble. The symptoms of Pearce's disease in California are identical with those of court noué, but investigators in California are of the opinion that the former is a virus disease. Until recently most French authorities regarded court noué, too, as a virus disease, but that view is now being superseded by the opinion that court noué is a nutritional disorder.

Spraying Schedule

The incidence of disease is related to climatic conditions, which vary with the locality and the year. For that reason it is not possible to formulate a spraying schedule to apply generally and the following should be modified to suit the circumstances:—

1. Just before bud burst spray the entire structure of the vine with 1 gallon of lime-sulphur in 10 gallons of water.
2. (a) When the shoots are 2 to 6in. long spray with Bordeaux 2 : 2 : 40, into which has been mixed colloidal sulphur at the rate of 2lb. per 100 gallons, and repeat



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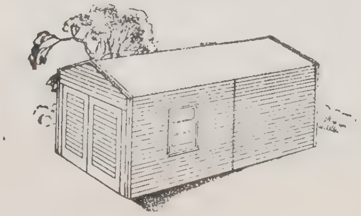

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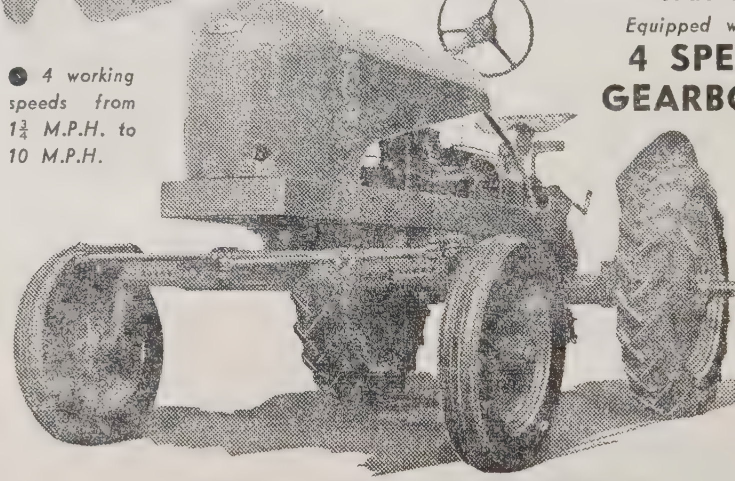

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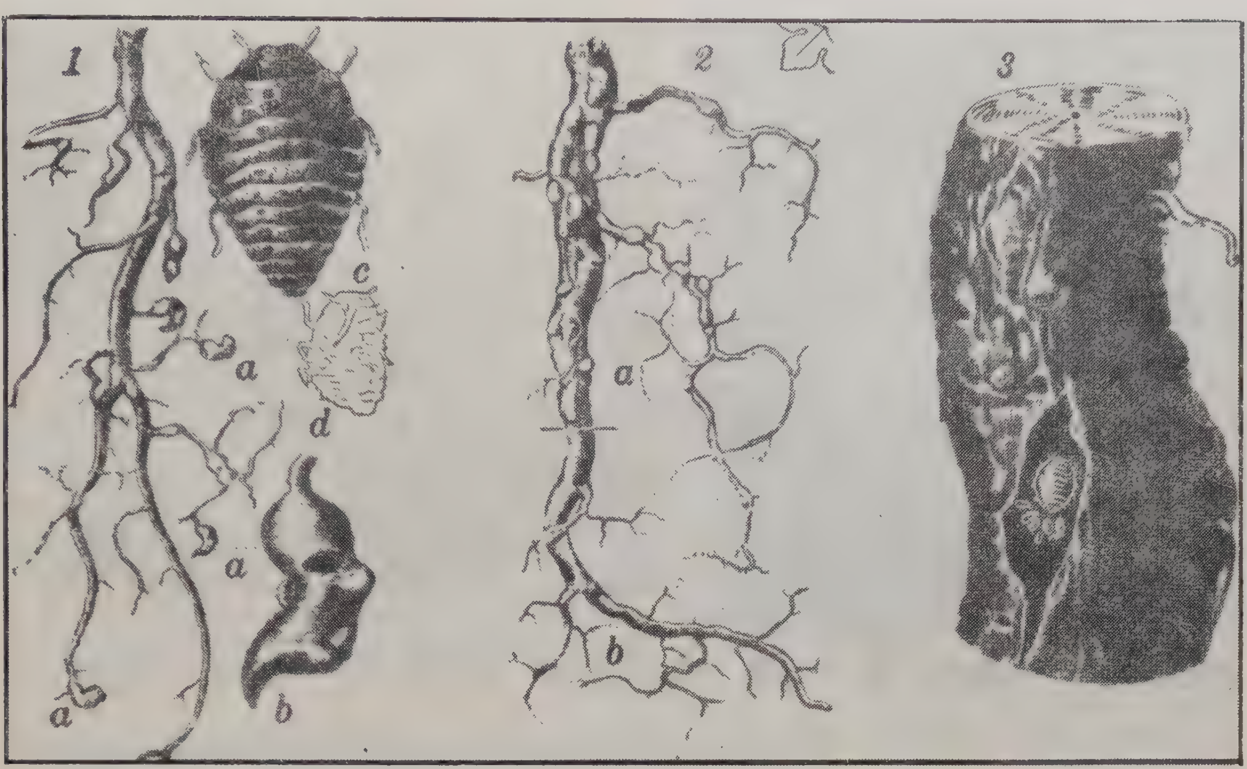


[*After Davidson and Nougaret, U.S. Department of Agriculture.*

The grape phylloxera. 1a—Root galls. 1b—Gall enlarged. 1c—Adult magnified. 1d—Side view of the insect showing proboscis used for sucking sap. 2a—Infested portion of small root. 2b—Normal root. 3—Large root showing insect and eggs in situ.

at intervals of every 2 weeks until grapes start to turn colour. In most cases no further spraying is required. For wine-making varieties it is an advantage to protect the bunches from botrytis rot, if humid, wet weather occurs before the berries are properly matured, by applying a late 1 : 150 lime-sulphur spray, unless, of course, serious splitting of the fruit makes immediate harvesting necessary.

(b) For control of caterpillars and other insects also include in the Bordeaux spray 1½lb. of arsenate of lead per 100 gallons or 1lb. of 50 per cent. wettable D.D.T. (½lb. of actual D.D.T.) as previously directed.

3. Between sprays dust with sulphur, choosing clear, warm, still weather for the operation.

Usually from 4 to 6 applications of sulphur are required for effective control of oidium if conditions are favourable for the development of this disease.

A modification which simplifies the disease-control programme and which has given good results consists of alternating lime-sulphur 1 : 180 with the Bordeaux and eliminating the sulphur dustings. Sprays are applied at 2-weekly intervals.

Preparation of Bordeaux Mixture

As the strength of Bordeaux mixture is varied extensively, a recommendation for this spray usually includes the recipe. The weight of copper sulphate (bluestone) is indicated in pounds by the first figure, the weight of hydrated lime or quicklime in pounds by the second, and the volume of water in gallons by the last figure. Thus Bordeaux 5 : 4 : 50 = 5lb. of copper sulphate, 4lb. of lime, and 50 gallons of water.

It is most convenient to use stock solutions of copper sulphate and lime

European Wasp will Attack Grapes

The European wasp (***Vespula germanica***), an unwelcome immigrant of recent years, was first reported in the Waikato district and has spread until the area where wasps have been recorded extends from north of Auckland to Taranaki. The wasps form a nest in the ground and the community consists of workers, queens, and males. Throughout spring and early summer their main food consists of other insects, but later they may feed on the sweet juice of a variety of fruits, including grapes.

So far only a few isolated instances of minor damage to grapes have been recorded in New Zealand, as the wasp is not present in large numbers in the commercial grape-growing areas.

To control the spread of the pest wasp nests must be found and destroyed by land occupiers. A free supply of chemical powder for destroying nests is available this season from offices of the Department of Agriculture.

[*After Slingerland and Crosby.*

Phylloxera galls on the under side of a vine leaf.

from separate containers for the mixing. The strength of each stock solution may be 1lb. per gallon. The lime suspension should be prepared from fresh, well-burnt lime, containing at least 90 per cent. calcic oxide. In mixing the ingredients the correct volume of either of the stock solutions is added first, then the full quantity of water, and finally the other solution is measured in. If the two strong solutions are mixed first and then diluted with water, the efficiency of the mixture is impaired. All sprays should be filtered through copper gauze of the finest mesh to obviate blocking of spray nozzles by over-size particles.

Use of Casein

The wetting or spreading power of Bordeaux can be increased with advantage by the use of casein; 5oz. of casein will suffice for 50 gallons of spray. Casein also helps Bordeaux to adhere to the foliage and to hold better against rain.

Casein can be dissolved most conveniently by using caustic soda, and a stock solution may be made easily from the following: Hot water, ½ gallon; caustic soda, ½oz.; casein, 5oz. This quantity is sufficient for 50 gallons of spray mixture. Good commercial spreading agents are also available.

Lead Arsenate

A preliminary soaking of the lead arsenate powder assists dispersion. If lead arsenate is used with Bordeaux, it must be added after the Bordeaux is mixed; if lead arsenate is used with colloidal sulphur and Bordeaux, it should be added last. Where lead arsenate is used in combination with lime-sulphur spray add 6lb. of hydrated lime per 100 gallons of lime-sulphur before mixing to counteract the chemical reaction between the lead arsenate and lime-sulphur.

Dual-purpose Spray

As most fungous diseases of the vine are controlled by either copper or sulphur sprays, it has been apparent to experts for some time that a notable advance in spraying technique could be made if both the fungicides could be combined and applied together. However, a difficulty arises in achieving this ideal, because the most suitable spray compounds containing copper and sulphur react chemically when mixed and the active fungicidal properties of both are either neutralised or impaired.

Some very promising results have been published recently by French research workers on the use of a copper cuprosulphite spray for the control of both downy mildew and oidium, but this compound is not yet obtainable for commercial use in New Zealand. At the Te Kauwhata Horticultural Station the writer, working on the same lines as French investigators, obtained rather good results with a mixture of dilute lime-sulphur and copper oxychloride—3½lb. of copper oxychloride, ½ gallon of lime-sulphur, and 100 gallons of water.

D.D.T.

The wettable form of D.D.T. is used on outdoor vines, as it is applied as a spray. At the rate of ½lb. of actual D.D.T. per 100 gallons it is deadly to caterpillars, thrips, and beetles. To obtain this strength the percentage of D.D.T. in the preparation has to be taken into consideration; for example, it would require 1lb. of 50 per cent. D.D.T. or 2½lb. of 20 per cent.

* * *

GRADING POINTS FOR EXPORT BUTTER AND CHEESE

Leading Factory Averages for Year Ended July 31, 1950

Contributed by the DAIRY DIVISION.

BUTTER-MANUFACTURING companies which obtained an average grade of 93.75 points or more and cheese-manufacturing companies which obtained an average grade of 92.75 points or more during the year ended July 31, 1950, are listed below in order of merit. Of the total listed, 35 butter and 11 cheese factories are in the North Island and 5 butter and 7 cheese factories in the South Island.

Cheese

Company	Registered number	Brand	Tonnage graded	Average grade points	Grading port
Momona	1010	Momona	375	93.107	Dunedin
Brooklands	1619	Brooklands	285	93.075	New Plymouth
Dalefield	9	Dalefield	770	93.060	Wellington
T. L. Joll (Auroa branch)	1723	Maori Chief	510	93.017	Patea
Waianiwa	1171	Waianiwa	69	92.989	Bluff
North Taranaki (Onaero)	723	Flax	169	92.983	New Plymouth
Brydone	1821	Brydone	352	92.914	Bluff
Bell Block	488	Bell Block	567	92.898	New Plymouth
Wright's Bush	206	Wright's Bush	325	92.883	Bluff
Tisbury	701	Tisbury	275	92.875	Bluff
North Taranaki (Waipapa)	212	Flax	518	92.803	New Plymouth
Riverdale	106	Trident	1288	92.799	Patea
Greytown-Wairarapa	529	Greytown	983	92.793	Wellington
Clandeboye	1517	Clandeboye	340	92.776	Timaru
Riverbank	985	Riverbank	484	92.772	Wellington
Rimu	1155	Rimu	65	92.769	Bluff
Kahui	493	Kahui	322	92.762	New Plymouth
Belvedere	486	Belvedere	543	92.754	Wellington

Creamery Butter

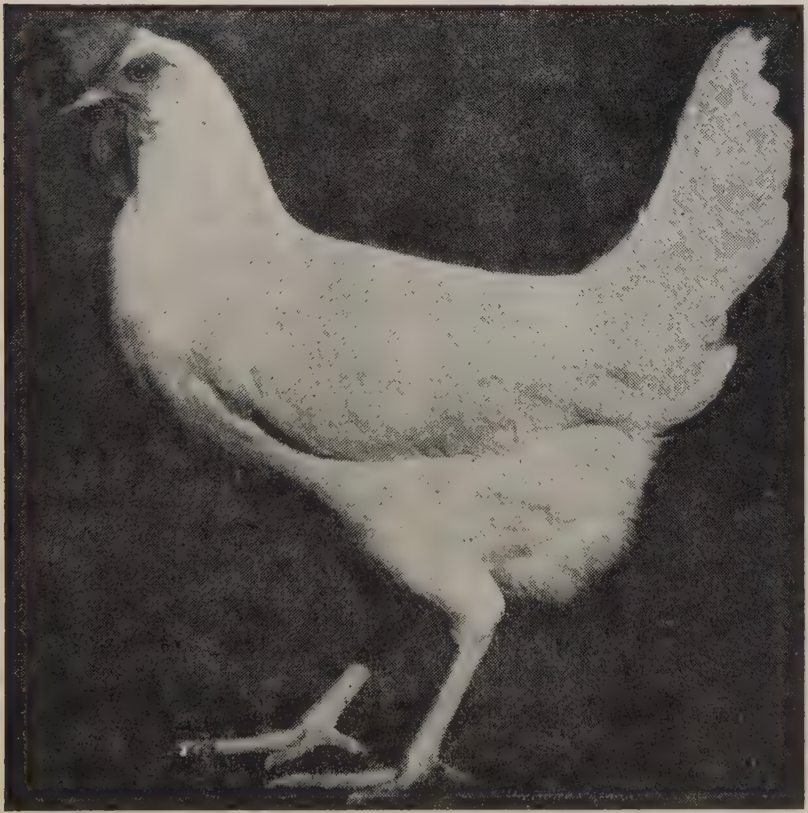
Company	Registered number	Brand	Tonnage graded	Average grade points	Grading port
Konini	1203	Konini	720	94.327	Wellington
United	1296	Whariti	298	94.310	Wellington
Westland	145	Westland	174	94.239	Lyttelton
N.Z. Dairy (Ngatea)	291	Anchor	1411	94.195	Auckland
Wairoa	1345	Wairoa	203	94.193	Hastings
Te Aroha-Thames Valley	344	Overseas	2495	94.173	Auckland
Rodney	394	Rodney	620	94.160	Auckland
Collingwood	1254	Golden Hills	317	94.150	Wellington
Taihape	1188	Tikapu	179	94.046	Castlecliff
Matakana	1375	Matakana	521	94.042	Auckland
Maungaturoto	1407	Otamatea	2149	94.032	Auckland
Inter-Wanganui	6	Inter-Wanganui	106	94.029	Lyttelton
Awahuri	664	Red Rose	908	94.025	Wellington
Okitu	1270	Okitu	125	94.021	Gisborne
Kuku-Manakau	905	Ohau	479	94.011	Wellington
Golden Bay	146	Sovereign	650	94.001	Wellington
Cheltenham	3	Pakeha	1395	93.991	Wellington
Rangitikei	1360	Rangitikei	708	93.989	Castlecliff
Ruawai	66	Ruawai	1739	93.971	Auckland
Rangitaiki Plains	133	Rangitaiki Plains	5594	93.967	Auckland
Wangaehu	1326	Wangaehu	501	93.965	Castlecliff
Whangarei	1720	Kauri	3395	93.917	Auckland
N.Z. Dairy (Tuakau)	1320	Anchor	3101	93.916	Auckland
Mercury Bay	485	Mercury Bay	623	93.915	Auckland
Raetihi	717	Raetihi	257	93.914	Castlecliff
Cambridge	1239	Cambridge	2006	93.878	Auckland
N.Z. Dairy (Ngongotaha)	724	Anchor	1423	93.830	Auckland
N.Z. Dairy (Waimauku)	332	Anchor	1109	93.828	Auckland
Masterton	1307	Masterton	559	93.820	Wellington
N.Z. Dairy (Morrinsville)	415	Anchor	3125	93.814	Auckland
Maungatapere	1710	Moana	1478	93.800	Auckland
Hikurangi	303	Hikurangi	2218	93.791	Auckland
N.Z. Dairy (Waiuku)	111	Anchor	2518	93.788	Auckland
Moa Farmers	341	Inglewood	1691	93.782	New Plymouth
Kaikohe	40	Kaikohe	277	93.780	Auckland
N.Z. Dairy (Paerata)	109	Anchor	1430	93.776	Auckland
Kaikoura	302	Kai	164	93.776	Lyttelton
Mangorei	345	Mangorei	1047	93.772	New Plymouth
Kia Ora	926	Kia Ora	632	93.768	Gisborne
N.Z. Dairy (Te Awamutu)	1880	Anchor	6668	93.751	Auckland

Selecting Young Pullets for the Household Poultry Flock

WHETHER a householder begins poultry keeping with day-old chicks or perching pullets, the number bought is usually small. That, probably more than inexperience in culling, is the cause of the owner continuing to rear the backward and obviously uneconomic type of pullet instead of taking the action which will save money in the long run. Apparently the purchase cost is kept too clearly in mind and the householder is loath to wipe out that "asset" by culling uneconomic birds. The commercial poultry farmer culls out weak, ailing, and backward pullets as quickly as he recognises them because he realises that they are a source of danger to the others. In this month's article for the domestic poultry keeper W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton, explains why the householder should follow the general principles of the poultry farmer, especially on the subject of culling.

[*Fraser Niederer photo.*

The head of an outstandingly good 6-month-old White Leghorn pullet.



[*Fraser Niederer photo.*

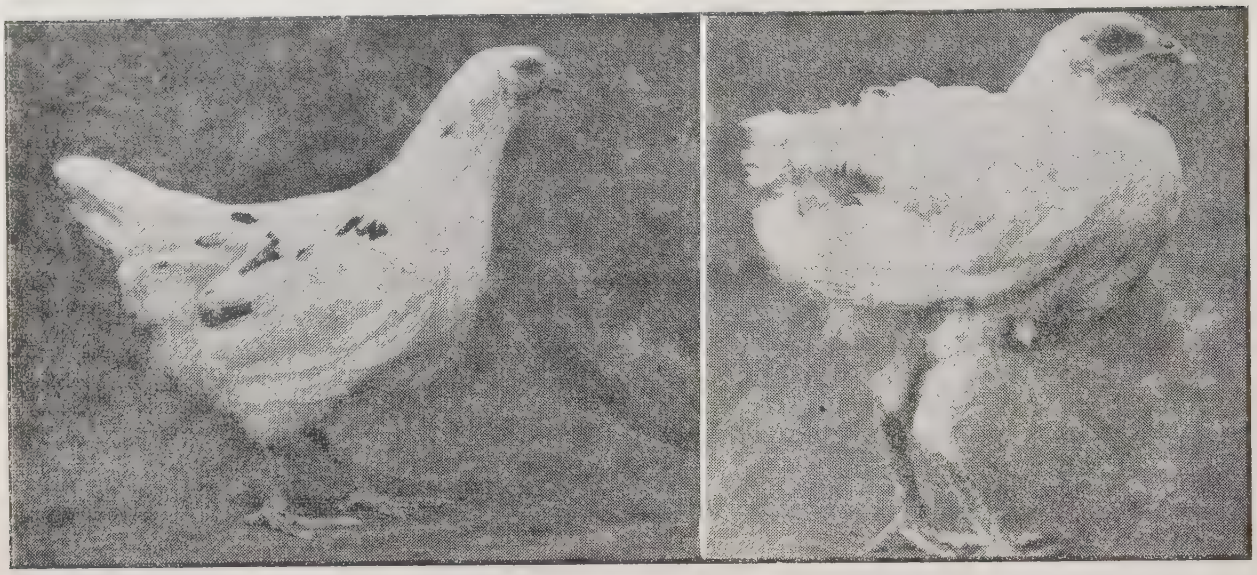
Every feature of this 7-month-old White Leghorn pullet foretells a strong, vigorous layer. The rugged head, alert eye, short beak, long back, deep front and abdomen, sturdy shanks, and the very stance all indicate the bird's laying potential.

A PULLET is not backward for its age or ailing in health without reason. That reason must be diagnosed so that steps can be taken to surmount the trouble. A sick chick shows symptoms which are fairly easy to recognise. The backward pullet also shows readily discernible signs, though it might be more difficult to decide exactly why one bird is backward while its mates identically housed and fed are not. A bird that seems unlikely to reach the standard of the average member of the flock is best killed immediately. The cause of the backwardness may not be clear, but it is certain that such a pullet has less stamina than the others, and when stamina is deficient a breakdown in health will not be long delayed. A chick or growing pullet lacking in vigour is the one most likely to contract an ailment or disease, which can then be spread to the others.

Prompt killing of obviously backward pullets should be regarded as the payment of an insurance premium to guard the good health of the rest.

Not for that reason alone does the poultry farmer cull out sickly and backward birds. He is concerned with profit and loss. The profit from a hen is the value of all the eggs it lays less costs of rearing, food, maintenance, and labour. If a backward pullet, which is sure to start laying late, does not lay eggs of a greater value than the cost of keeping it, the bird is better out of the way so that more space is left for the superior birds. In such points it is proper that the backyard poultry keeper emulate the farmer.

Without doubt culling should be started on the birds' first day in their new home. If the householder hatches his own chicks, they should be culled



[*Fraser Niederer photos.*

A contrast in crossbred pullets. Left—An Australorp-White Leghorn cross with good depth of abdomen which is a promising sign. Depth is measured from the socket of the tail to the rear end of the keel (breastbone). Right—A very poor type of crossbred pullet with cut-away abdomen and poor feathering. Such long-legged birds are usually slow in developing and low in laying ability.

[*Fraser Niederer photo.*

A backward 4-month-old Australorp pullet with pale, dry skin on face, sunken eye, and slow feathering on head and neck. Such a bird should be culled out.

[*Fraser Niederer photo.*

This White Leghorn pullet is almost 4 months old. The extreme length of face and beak, eye very high in the skull, baldness, and dryness of skin all show that prompt killing will save food and money.

on the day of hatching. If the chicks are bought locally, they should be culled immediately they arrive and the culls taken back to the supplier. If too many appear to be culls, or if some mishap seems to have occurred to the chicks in transit, the buyer should communicate with the supplier immediately and refuse to accept the chicks.

Culling must be continued all the time. A watch must be kept for weaklings, but, in addition, regular periods should be set aside for special culling. After the day-old stage the chief times for culling are when the birds are 4, 6, and 8 weeks old, then at 3, 4, and 6 months.

Signs of Good and Poor Birds

Examples of both excellent and uneconomic types are illustrated with this article. In brief, the good type has a rugged head, alert eye, healthy appearance about the face, short, strong beak, long back, deep front and abdomen, sturdy shanks, and strong frame. The feathering and pigmentation of legs and beak are also evidence, but breeds vary in these respects. Weakness is frequently shown by an elongated head and beak, shape and position of eyes, uneven feathering, and length of legs and toes.

The worth of each bird is decided virtually by comparison. The amateur should study the illustrations, memorise the main features to be examined, then inspect the pullets one at a time, at the same time comparing each bird with the average standard of the group. When young, growing pullets are being culled the only ones of concern at the time are those that compare unfavourably with their mates. If the comparison is too unfavourable, the bird is not worth keeping, but if there is room for doubt, it can be legbanded with a ring of a distinguishing colour so that it can be watched all the more carefully for the next few weeks.

Influence of Age

At all stages the age of the pullets influences the interpretation of signs, but that factor is most useful at the time of maturity. Light-breed fowls mature and begin laying at an average age of 6 months. Some strains begin laying as early as 4½ months. Pullets hatched early in the season are likely to start laying at a younger age than late hatches. Heavy breeds take about a month longer to mature than light breeds. A pullet which lags too far behind the majority in maturity should be culled.

September-hatched White Leghorns may be quoted as an example. If some begin laying at 5 months, the majority at 6 months, and most of the others at 7 months, those that remain require careful examination. If any appear unlikely to start "reddening up" for a month or more, they should not be retained any longer in the hope that they may prove worth while after all, but should be sold immediately. Early-maturing birds, if they are fed and managed properly, frequently are late moulters; that gives them a long laying season. Late-maturing pullets all too often turn out to be early moulters, which reduces profit.

If a dozen pullets are needed for the laying house, the householder should not start with 12 chicks. Ample allowance must be made for mortality and culling. It is better to rear too many than too few, retaining the best and sending the balance to the mart.

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NEW POULTRY BULLETIN

A new bulletin on domestic poultry keeping, written by W. L. McIver, who contributes the monthly articles on the subject in the "Journal", has just been published. It describes the most modern methods which make for efficiency and labour saving. Bulletin 336, "Household Poultry Keeping", is obtainable free from the nearest office of the Department of Agriculture.

◆◆

Greater Use of Agricultural Lime in South Canterbury

By J. D. WRAIGHT, Fields Instructor, Department of Agriculture, Timaru.

THE growth of "lime consciousness" among farmers in South Canterbury is shown by the greatly increased quantities of lime now being used. The district, which on the whole responds excellently to applications of lime, has numerous outcrops of limestone, and the wider usage has resulted from new developments in production, which are discussed in this article.

DURING the last 10 years three developments in the production of agricultural lime in South Canterbury have substantially affected the amount of lime produced in that area. These developments have been:—

1. The extraction of limestone from the quarry by "rooting" instead of by quarrying in the usual way.
2. The setting up of a number of home-owned plants by farmers who have lime deposits on or near their farms.
3. A "travelling" lime-crushing plant which will produce agricultural lime in areas remote from rail and where limestone outcrops occur.

A home-owned lime production plant at Upper Waitohi.

Rooting Lime

The first innovation, that of rooting the lime instead of blasting and spalling the stone to reduce it small enough to go through the crushing machinery, was evolved by the Public Works Department in 1939, when a track-laying tractor and an earth-rooter were used experimentally in the Hanging Rock district of South Canterbury.

This experiment was undertaken as the result of requests by farmers, who suggested that Public Works Department machinery might be used for the production of lime in areas remote from rail. It was found that where the limestone was not too hard this machinery could root it up in flakes sufficiently small to be fed into crushing machines and that the process of bulldozing the material into the chute feeding the crusher rendered it still finer, so that it required less crushing than spalled rock.

The outcrop on which this experiment was conducted is typical of most of the limestones of South Canterbury in that it is not a very hard stone. The degree of hardness can be tested by scratching a sample with a pocket knife; if it is possible to carve into the stone with the knife, it is usually possible to extract it by the rooting method. It is usually necessary to make some adjustment to the ordinary type of earth-rooter before it can operate successfully on limestone, and this adjustment pertains mainly to the angle or pitch of the points of the rooter. In rooting limestone only a very gradual angle is required, as the machine does not rely on digging into the stone for its efficiency; rather, it chips the limestone off in flakes not much more than 6in. deep.

Once it was thus established that certain limestones could be rooted successfully one large manufacturer put this method into operation in his quarry. At first a small rooter was used which was designed for scarifying pavements and roads and which could be drawn by a 40 h.p. tractor. Later, however, the manufacturer installed a large rooter similar to the one used in the Public Works Department experiment and which is drawn by a 100 h.p. tractor. This larger unit actually produces 400 to 500 tons of rooted material during an 8-hour working day. Instead of many men being engaged in shooting, spalling, and loading limestone, the whole output of the quarry is now produced by two men—one man operating the rooter and the other bulldozing the material over the edge of the outcrop, whence it is taken by a drag-line scoop into the crushing plant.

This modern method of extracting lime in large commercial quarries is gradually becoming more widely used wherever the stone is not too hard. Manufacturers are abandoning the old costly methods and are accepting the new, which requires a minimum of manpower and which is capable of producing daily tonnages not obtained before.

Home Production

According to official figures South Canterbury farmers received by rail during each year between 1936-37 and 1945-46 quantities of lime varying between about 12,000 and about 22,000 tons. In the 3 years after 1945-46 the tonnages railed were 34,307, 42,167, and 49,922 respectively. Apart from the farmers whose lime requirements were covered by these figures and who were within reasonable cartage distance from rail, there were many others who were in districts remote from rail, where their soils required heavy dressings of lime and where there were limestone outcrops. It was among these energetic and long-sighted farmers that the second important innovation in the production of agricultural lime, that is, the home production of lime by a small plant, was first developed.

The first home-owned plant in South Canterbury was installed by a farmer whose property was situated 15 miles from the nearest railway station. This farmer was contemplating a full liming programme over 800 acres, but the cartage cost would have been too great. He therefore installed his own

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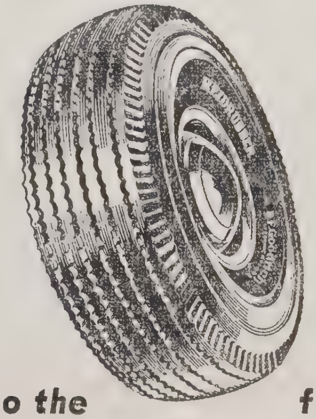

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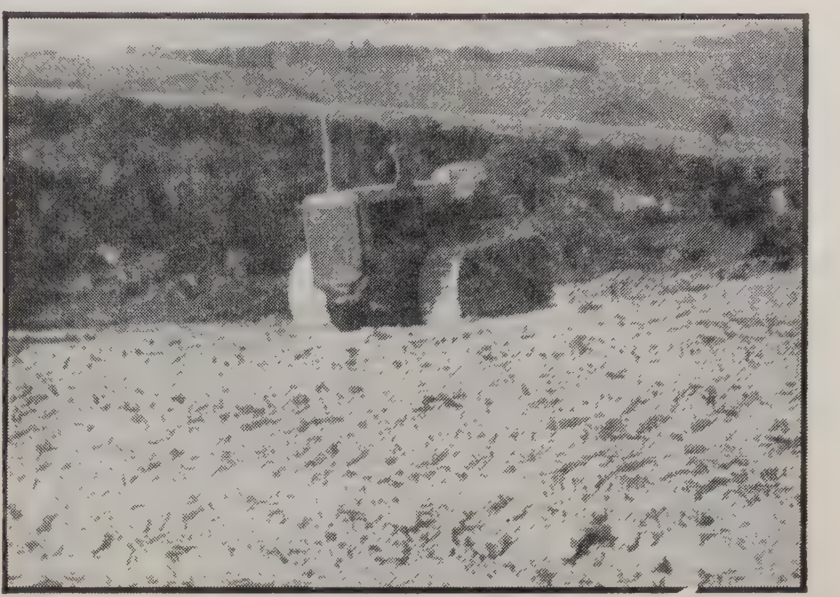
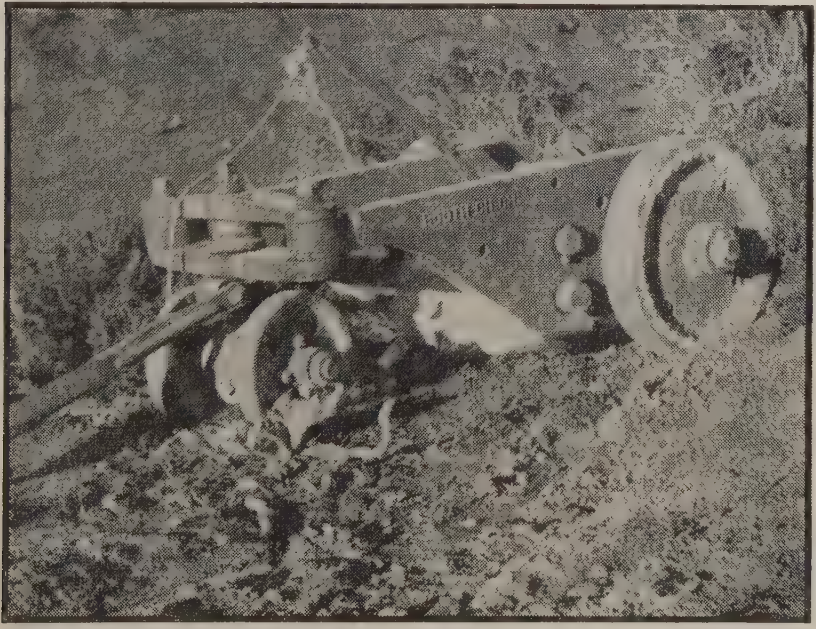
small lime-grinding plant. In this case the only specialised machinery found necessary was a pulveriser of a capacity of about 5 tons per hour, which was driven by a belt from a farm tractor. The stone was spalled and fed down to the pulveriser through a covered storage bin capable of holding spalls sufficient for a day's crushing. This small plant has produced approximately 2000 tons since its installation, and has enabled the owner to apply about 2 tons of lime per acre over his whole property. The increased production from this property has already more than covered the total expenditure on the lime-crushing plant.

Another plant was installed by two farmers in co-operation in the Kakahu district. In this unit the stone was quarried by the usual blasting method, after which the material was passed through a primary jaw-crusher mounted directly above a hammer mill or pulveriser. This plant has done very good service, having made it possible to lime both properties adequately. It must be remembered that there are no facilities for drying the limestone artificially, but in the quarrying process large heaps of spalls are set up, covered, and allowed to dry out naturally. The ground product has caused no difficulties in spreading, as most modern lime sowers are of the forced-feed type, and can readily handle this material.



A field of rooted limestone ready for crushing.

The most recently installed plant is one operated by two farmers at Upper Waitohi. This unit differs in its layout in that the lime is not quarried, but is rooted by a heavy scarifying machine. The rooted material is then gathered up by a rotary scoop and taken to the edge of the limestone outcrop. From there it is pushed down over the edge into a large chute by a home-made "dozer" constructed from an old grader blade attached to the drawbar of a tractor. From this chute it is fed into the pulveriser, which is capable of handling about 15 tons of finely crushed lime per hour. The rooted material is mainly "fines", with some pieces up to 6in. in size, so there is no necessity for a primary crusher when employing this method.



An earth rooter used to scarify limestone.

An interesting feature of this Upper Waitohi plant is the method of transport. There are three 3-ton dual-wheeled trailers and a 3-ton farm lorry, each of which is fitted to take a lime spreader. The production is such that a 3-ton trailer can be loaded in about 11 minutes, and the best day's crushing so far has produced 90 tons of lime.

Travelling Plant

The third significant innovation in the lime trade in South Canterbury is a travelling plant which moves from one outcrop to another, extracting and crushing the lime, and delivering and spreading the finished product unbagged on nearby farms. Associated with this plant are three trucks and one lime-spreading vehicle. Two of the trucks usually work together, supplying the lime spreader. The third truck both carts and spreads, using an ordinary detachable box-type spreader, on the flatter areas.

Evaluating Limestone Samples

As a result of these developments there is now no need for a farmer in South Canterbury to go short of lime because of rail or road transport difficulties. The Department of Agriculture offers assistance to farmers proposing to work limestone deposits; it has in its various offices the equipment necessary to evaluate any limestone sample at short notice. A limestone showing 70 per cent. or more of calcium carbonate is suitable for crushing and applying to the land.

Pig Feeding Trials on Skimmed Milk

By E. D. EDWARDS, Technical Assistant, Department of Agriculture, Wellington.

THE increased costs of supplementary meals may have created an impression that it is not profitable to use them with skimmed milk for pig feeding. A recosting of the results of trials with various meals as supplements to skimmed milk reveals that this costless (to the pig producer) dairy by-product gives today an increased farm return sufficient at least to cover the rise in costs since 1942, when pig meat was 6d. per lb. and meals averaged 12s. 6d. per cwt.

[Desgranges Studios photo.

THE following review of the results of trials carried out under the district pig council on three farms in the Auckland district indicates that where meat meal forms a limited portion of the supplementary meal it is the most economical. Similarly a certain class of proprietary mixture can be as economical. A satisfactory return may be obtained from other concentrates, but their value is increased by the addition of meat meal.

The downward trend in pig production in recent years has resulted in a considerable wastage of skimmed milk. The increased costs of concentrates may be a contributing factor in this situation, but the careful use of limited amounts of meal is usually accompanied by an appreciation of the value and limitations of skimmed milk and a more efficient utilisation of it.

The relative values of skimmed milk when supplemented by various meals under present price relationships have been determined by a reassessment of data obtained during feeding trials conducted in 1942. In each trial a minimum of 6 Large White pigs were used at first. Some were sold during the trials, but on each farm the number sold was divided evenly between trials.

The meals used and their adjusted values for the analysis are shown in Table 1.

The value of pig meat in 1942 was taken as 6d. per pound and for 1950 as 11d. per pound.

Table 2 indicates the values of skimmed milk obtained from the trials under the conditions already indicated.

There were no trials in which meat meal was fed as the sole supplement. However, in those trials where it was used with a carbohydrate meal in addition the mixed meal gave ½d. higher return per gallon of skimmed milk than did the non-meat meal trials. The average return for skimmed milk after deducting the cost of meal is 3d. per gallon as against 2½d. per gallon where a carbohydrate feed only is used.

When forming the major portion of a meal supplement and compared as in Farm 3, meal A at £50 per ton gives a lower return by 1d. per gallon of skimmed milk than meal B at £18 per ton. In this analysis proprietary meal B is equally as good as meat meal B.

The results of this trial justify the use of a combined meat meal-cereal meal supplement with skimmed milk up to porker stage. If ¾lb. of meal per pig per day, costing 2½d. per lb., is used, porker weights can be reached with an expenditure of about 8s. 6d. on meal per pig, thus giving a return of 3 1/3d. per gallon of skimmed milk. If the food consumed by the dry sow and the litter to weaning is included, the return per gallon is reduced to about 2d.

There appears to be no justification for the use of high-priced proprietary mixtures the price of which is far beyond that which would be fair for a mixture of the main feeding-stuff ingredients available today. Fancy mixtures with small quantities of ingredients for which special virtues are claimed should not be preferred to good-quality straight grains, meals, or mixtures of these.

TABLE 1—MEAL PRICES, 1942 AND 1950

Meal	1942	1950
Meat meal A (50 per cent. protein)	9s. 6d. per 112lb.	12s.
Meat meal B (60 per cent. protein)	14s. per 112lb.	18s.
Proprietary meal A	38s. per 100lb.	50s.
Proprietary meal B	13s. 6d. per 100lb.	18s.
Copra	9s. 6d. per 100lb.	For the carbohydrate meals barley meal has been substituted on an equivalent food-unit basis and having a value of 22s. per 100lb.
Whole maize (shelled)	12s. per 100lb.	
Barley meal	15s. 6d. per 100lb.	
Wheat meal	17s. 3d. per 140lb.	
Molasses	14s. per 112lb.	

TABLE 2—SUMMARY OF RESULTS OF 8 FEEDING TRIALS

Farm	Meal used to supplement skimmed milk	No. of days on trial	Increase per pig per day lb. carcass weight	Carcass weight per pig at beginning and end of trial		Cost of meal per pig 1950	Return per gallon on skimmed milk (pence)	
				Beginning	End	s. d.	1942	1950
1	Copra	125	.80	33	133	20 3	1.41	2.29
	Maize	125	.78	33	130	13 7	1.32	2.43
2	Meat meal A, copra, and molasses	98	.80	33	111	21 9	1.39	2.63
	Cereal meal, copra, and molasses	98	.84	33	116	33 1	1.19	2.25
3	Meat meal B, copra, and molasses	71	.93	34	100	20 9	2.00	3.11
	Proprietary meal B and molasses	70	.80	33	90	10 3	1.58	3.16
	Meat meal B, copra and molasses and minerals	49	.80	33	71	14 1	2.06	3.23
	Proprietary meal A and molasses	70	.83	33	91	24 0	.81	2.18

BY-PRODUCTS OF THE MEAT-FREEZING INDUSTRY

This is the second of two articles on the meat-freezing industry by I. B. Chisholm. The first appeared in the September issue of the "Journal."

EDIBLE MEAT BY-PRODUCTS

Edible meats include any part of the animal other than the carcass meat which, when properly processed, is directly or indirectly a nourishing food. All these meats usually come under control of the one department, which is equipped with stainless steel tables that are easily kept clean and have an abundant supply of hot and cold water, all of which are necessary for the preparation of edible products under sanitary conditions. The department should be close to a freezing chamber especially set up for the chilling and freezing of such products quickly and efficiently.

In New Zealand some of the smaller edible meats are not saved because the production of such meats is so small that collection is not warranted.

Brains

The heads are opened by a powered blade so designed as to split the head lengthwise and leave the brain untouched. The brains are placed on trays to drain, after which they are packed in boxes to be sold fresh, frozen, or preserved in cans. Few works save beef and hog brains.

Tongues

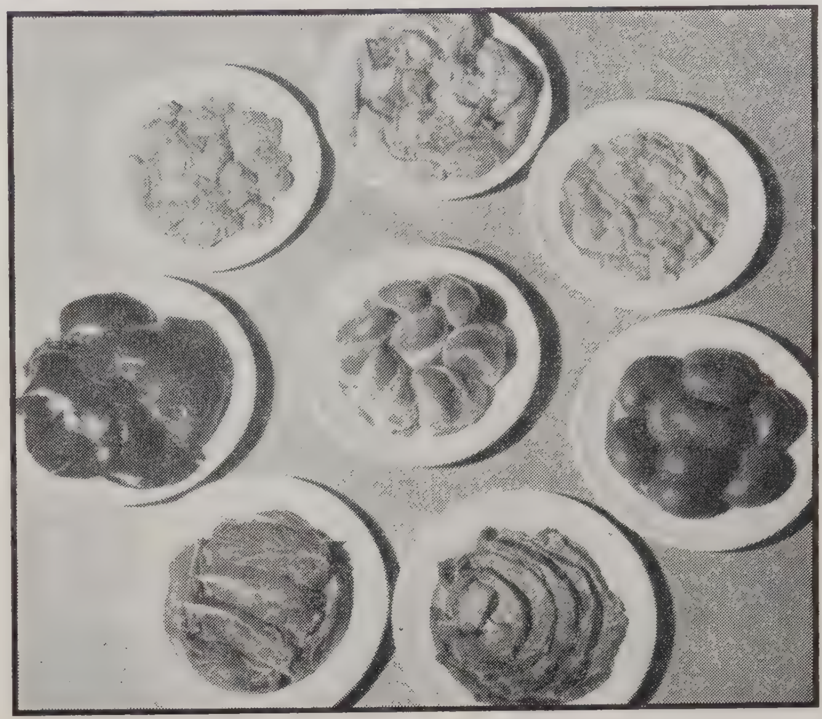
Ox tongues are carefully removed from the head on the killing floor and sent to the department where they are washed free of blood and slime and hung up to drain. The tongues may be divided into two classes: Long-cut are tongues trimmed smooth on the sides and butt without the windpipe attached; short-cut are tongues which are cut through the thyroid cartilage, leaving the epiglottis attached. Tongues may be sold fresh, cured, or canned, or frozen in moulds for export.

Sheep, lamb, calf, and hog tongues are washed and drained. These may be sold fresh, cured, or frozen on local markets, or canned for local or overseas consumption.

Sweetbreads

The by-product known as sweetbreads is actually the thymus gland, which consists of two portions, one situated on both sides of the windpipe and the other covering the upper part of the heart. Each of these portions is removed separately from the pluck and they are sometimes packed separately as heart or throat sweetbreads.

The thymus gland inhibits the activity of the sex glands, so is prominent only in young animals. In calves at maximum development the gland may weigh up to 1½lb., after which it slowly diminishes until in 3-year-olds just a vestige of the original gland remains. After the lambs reach approximately 6 months of age the gland quickly disappears.



Some edible fancy meats of sheep and lambs. Left to right, top—Brains, tongues, sweetbreads. Middle—Livers, hearts, kidneys. Bottom—Thick skirts, thin skirts.

When the sweetbreads are picked from the windpipe and from the fat surrounding the heart they are placed in ice-chilled water to harden the adhering fat. Later the fat is picked off and the sweetbreads are placed again in iced water, where they are best left overnight to remove any blood clots. The sweetbreads are then drained on wire-mesh trays and packed in grease-proof paper-lined moulds or in cartons. These may be sold fresh or frozen according to requirements.

The sweetbreads of calves are often frozen separately on galvanised iron or wooden trays and disposed of in bulk to hospitals or similar institutions.

Hearts

The hearts of beef, calves, sheep, lambs, and hogs are all handled in much the same manner. The hearts are cut from the plucks, washed in cold running water, and drained on wire-mesh trays. When these are graded into sound and cut hearts they are placed inverted on trays or in bulk in moulds, which are packed on shelf coils in the freezer at 8 to 10 degrees F. Apart from small local requirements the bulk of hearts are packed in hessian bags lined with stockinette and exported.

Livers

Livers of beef, calves, sheep, lambs, and hogs require careful handling and close inspection before they are passed for human consumption. The livers are trimmed of all surplus fat and connective tissue, leaving the lymph portal gland intact when export livers are being handled. The gall sacs are pulled off and sent to the gall room for further processing.

Common diseases of the livers are hydatid cysts and fluke; tuberculosis occurs in beef and hogs only. Livers with fluke and hydatid cysts and malformed livers are rejected and sent to the tallow and manure department.

The livers passed should be hung on hooks to cool and drain before packing. Sheep, lamb, calf, and hog livers are packed in cardboard cartons lined with wax-covered inserts or in pails and placed on shelf coils for freezing hard, after which they are packed in more substantial outer cartons ready for export. Beef livers are usually frozen hard in wooden or iron moulds and packed in hessian bags lined with stockinette.

Kidneys

Kidneys are removed from sheep, beef, calves, and hogs only. The kidneys are usually removed from the carcass on the killing floor and sent to the fancy meats department, where the connecting vein and casing are cut off. After inspection the sound kidneys are wiped over with warm damp cloths to remove any fat still adhering. They may be frozen separately on trays to be disposed of locally or packed in cartons or boxes for export.

Skirts

Skirts, which are muscular portions of the diaphragm, are usually divided into two classes—thick and thin pieces—for sheep and lambs. Skirts are used

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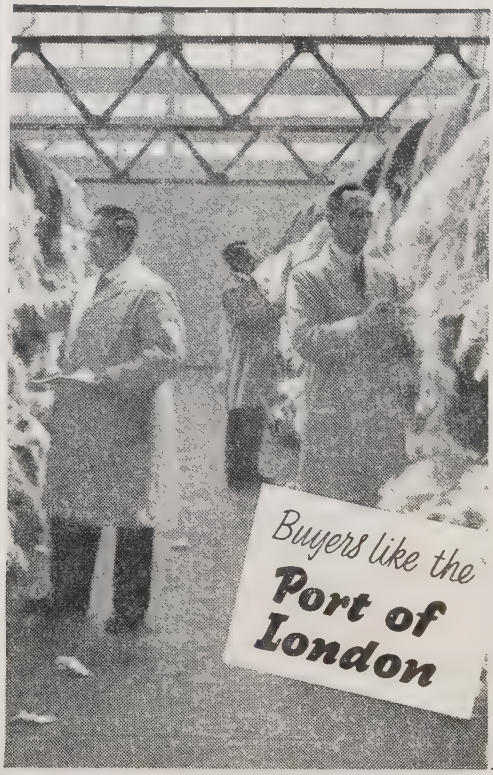

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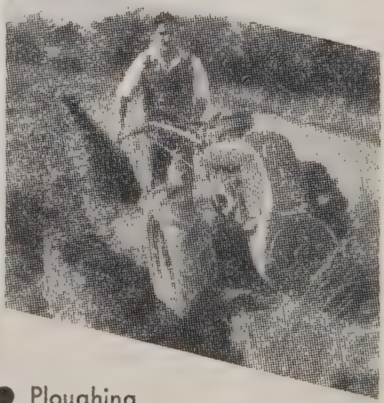

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for manufacturing purposes. The thick skirts from beef carcasses are frozen flat separately on trays and exported, the thin skirts being sometimes left on the dressed carcasses.

Spleen or Melt

The spleen or melt is a ductless gland and is situated across the stomach between that organ and the belly wall. Its action in the animal is primarily to store blood and iron and generate white blood corpuscles, thus giving the gland high protein content. Spleens are saved from beef, sheep, and hogs in a few of the bigger freezing works where meats are manufactured on a large scale.

Lungs

Lungs may be used for meat-manufacturing purposes, but are usually processed into meals or manures.

Ox and Hog Tails

Tails are washed and trimmed and drained before packing and may be sold fresh or frozen locally or overseas. Hog tails are sometimes cured and/or frozen for local or export trade.

Ox Cheeks

Cheeks are cut from the head on the killing floor and sent to the fancy meats department at regular intervals. Here they are washed and scrubbed in warm water and drained before packing in wooden or iron moulds. They are usually exported, but may be used for local manufacture.

Caul Suet

Caul suet (omentum) extends from the stomach to the colon and surrounding the viscera. From beef, the fat is usually processed into first-grade edible beef tallow, but may be handled as a fancy product to be sold in its raw state or as dripping. The caul fat from spring lambs is often used in the fancy dressing of the carcass, but the bulk of the raw fat is rendered into first-grade edible mutton tallow. From hogs, the fat is processed into a second-grade lard.

Kidney Fat

Kidney fat is found in the lumbar region of the carcass covering the kidneys. Known as kidney knobs on the hindquarters of chilled beef, this fat may be made into dripping or first-grade beef tallow. The kidney fat is removed from sheep only on the killing floor (lamb fat is left in the dressed carcass) and rendered into first-grade mutton tallow. Flare fat (as it is known) from hogs is processed into a fine-grade leaf lard.

Ox Tripes

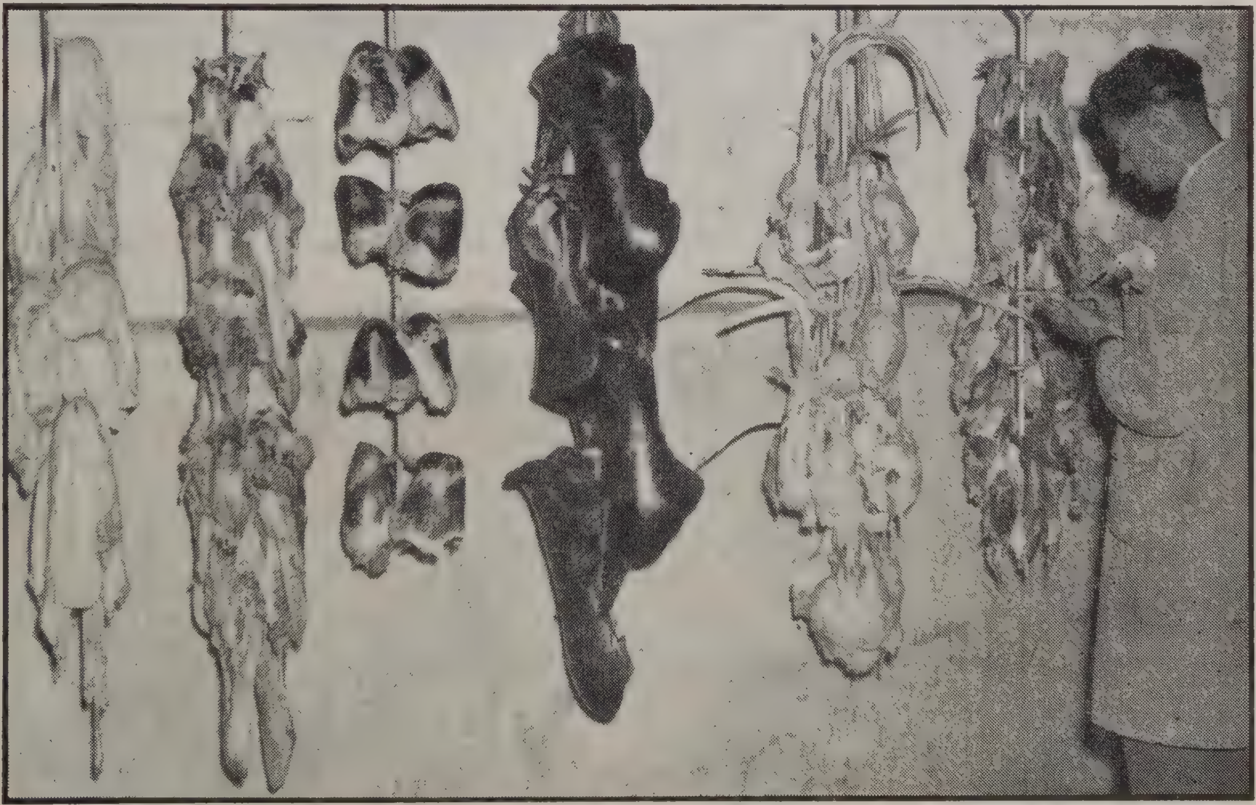
Ox tripes are selected for good colour and condition from ox stomachs, the rumen and reticulum (honeycomb) portion of each stomach being used. In the tripe room they are scalded and cleaned in a perforated cylinder which rotates inside a drum. The tripes are placed in the cylinder and water at approximately 145 degrees F. is run into the drum followed by a mixture of hydraulic lime and soda crystals, the quantity varying with the number of tripes in the cylinder. The cylinder is revolved quickly and the temperature is maintained at 140 degrees F. until the tripes are clean. While the cylinder is still revolving, the washings are run out and the tripes are rinsed out in cold water for a few minutes, after which they are removed. A close examination of each tripe is made and any pieces of its original contents that still remain are scraped off. The tripes are then drained for at least 30 minutes if they are to be taken to the freezer for storage or for export.

Cooking

The cleaned tripes are placed in an open cooking vat containing fresh water and cooked at 200 to 210 degrees F. until they are just tender. It is not uncommon for the tripes to be bleached in a weak solution of hydrogen peroxide. Tripes may be sold fresh or frozen for local or export trade, according to demand.

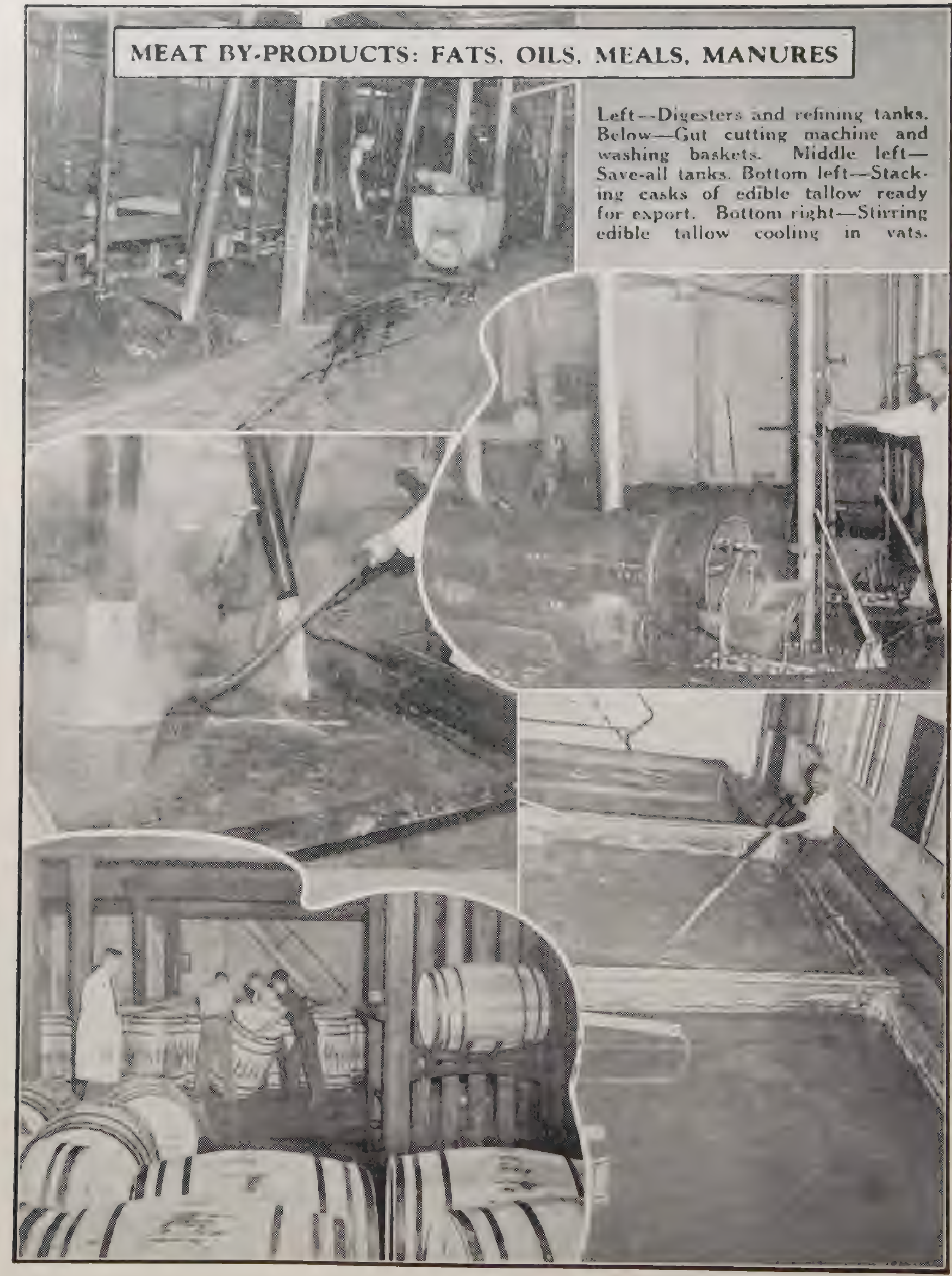
Other Edible Meats

There are other minor edible meat by-products, namely: **Cattle:** Giblet meat, fries, heads, head meat, lips, snouts, rennets, udders, bones (gelatine), fats (oleo-stearine), feet (jelly), meat trimmings, and blood. **Sheep:** Cheek and head meat, cutlets, ears, faces, giblet meat, heads, lips, snouts, stomachs, fries, and meat trimmings.



Some edible fancy meats of cattle, from left—Suet, tongues, hearts, livers, tails, and cheeks.

MEAT BY-PRODUCTS: FATS, OILS, MEALS, MANURES



Left—Digesters and refining tanks. Below—Gut cutting machine and washing baskets. Middle left—Save-all tanks. Bottom left—Stacking casks of edible tallow ready for export. Bottom right—Stirring edible tallow cooling in vats.

Hogs. Cheek and head meat, cutlets, ears, faces, giblet meat, lips, snouts, chitterlings, stomachs, skins, trotters, meat trimmings, and blood. These, although mostly used for manufacturing purposes, are important to the industry.

FATS AND OILS

The technology of fats and oils, like that of many other by-products, is very specialised and possibly more so because of the many variations in the processing of each product.

Correct handling of the raw materials from the moment they leave the carcass on the killing floor to the rendering department is as important as the processing itself. Chemical and bacterial action commences almost immediately on the killing floor and delay in delivering the materials to be processed, or contamination at any stage, accelerates the process of decomposition.

Two principal causes of decomposition are: Rancidity, which is an oxidisation process which produces free fatty acids; and hydrolysis, which is the action, under certain conditions, of the fat taking up the elements of water, yielding glycerol and fatty acids.

All raw fats should be rendered immediately or chilled if they must be held over; if they are held over without being chilled, the bacteria will split the glycerine and fatty acids, which are basic constituents of fat, and the proteins will decompose to produce free nitrogen and ammonia, thus reducing the content of these elements in the resulting tankage.

The selection of raw materials to be rendered down to yield the best possible tallows and oils is the first important step. Materials for edible fats generally comprise all fats and fresh bones (from the boning room) which have not been contaminated by offal during slaughter or succeeding processes. Inedible fats include condemned carcasses, condemned or rejected offals of all types, trimmings, scrapings, and generally all other materials which have no further economic value as individual products.

The rendering of crude fats or raw materials may be done by three principal methods: Open pan and wet and dry rendering.

Open Pan Method

Among other methods the steam-jacketed open pan is generally used by bacon companies or freezing works for rendering lard, because the daily production of these fats is usually not large enough to warrant the use of larger and heavier rendering plants. This method is rather primitive for rendering inedible materials, as the odours given off are objectionable. To render edible pig fats into lard, all fats are hashed up through a mincer into a steam-jacketed kettle. Cooking is continued with agitation until there is no further steam coming from the contents of the kettle and the light brown dry cracklings (fibre of fatty cells) float on the fat. The hot fat is then run off through sieves to the refining tanks. The cracklings may be pressed to remove the excess lard, which is sent to the refiners.

Wet Rendering

For the process of wet rendering a vertical tank or cylinder known as a digester is used. The top of the digester is dish shaped and is provided with a manhole through which the raw materials are loaded. At the bottom of the side is another manhole through which the offal or hash remaining after cooking is withdrawn. At the level of this opening perforated steel plates cover the cone-shaped bottom of the tank, which prevents the materials blocking the outlet valves. Water is run into a level just above the plates to prevent the materials from packing too tightly and to assist the cooking process.

When the digester is almost full it is closed up and the steam turned on. A pet-cock may be left slightly open to allow circulation of the steam, but too much circulation would cause the contents to agitate, resulting in emulsification of the fat, and would prevent proper separation. Cooking time depends on the size of the digester and the materials being rendered.

There are two methods generally used in New Zealand of removing the crude tallow from the digester when the materials are cooked.

Blowing

When the steam is turned off the digester is sealed up tightly and its contents are left for half an hour to settle and separate. Then a valve at the bottom of the digester is carefully opened and the pressure still inside forces out the water or gravy, which has separated from the tallow, into the save-all tanks. A small tell-tale tap shows when all the gravy is blown out and at that point the pipeline is diverted into the refining tanks to deliver the crude tallow.

Floating

After cooking, the pressure is slowly released from the digester and the contents left to separate for half an hour. Water is slowly introduced from the bottom, floating up the tallow to the top of the tank and running it direct to the refiners.

Steam-jacketed Rendering

In a steam-jacketed digester the materials are cooked in the same manner as in wet rendering, with the exception that a gravy from previous cookings is used in place of water. In digester cooking it is necessary to have a circulation method; therefore in a jacketed system gravy is used with the purpose of concentrating the liquids to a heavier density. This has no advantage—in fact it has a slight disadvantage—to fats in that the gravy has a high free fatty acid content. The use and value of this gravy system are described in the fertiliser section.

Dry Rendering

The raw materials are placed in a horizontal steam-jacketed cooking tank or cylinder equipped with a number of rotating arms to agitate the materials during cooking and to keep the surface of the shell clean to aid transmission of heat to the materials. In the rendering of raw fats it is common practice to expel the moisture through vents during cooking. In the processing of other heavier or uncrushed materials the cylinder is tightly sealed after allowing the first gases to escape for a few minutes at the beginning of cooking. The steam that is developed from the moisture in the product is allowed to build up inside the melter with the purpose of disintegrating the meat, bones, and fat cells, thus giving the highest possible yield of fat from successive operations. After internal pressure cooking the gases are released into deodorising tanks and cooking is continued to remove the remaining moisture through open vents. During the latter part of the cooking the free fat in the melter is run out into holding tanks. The cooked materials are then ejected from the melter into an open tank with a perforated false bottom, where the excess free fat drains away to the holding tanks or refiners.

Refining

The common principles involved in the refining of all fats are to remove moisture and impurities. In a few works in New Zealand fuller's earth is used as a bleaching and refining agent; it has the value of improving the colour and subsequently the grade of the fat.

A comparatively simple method of refining is to spray water over the fat while it is still very hot in the refiner to wash down the impurities. A little salt may be sprinkled over the fat if desired to help this action. The fat is left to settle and after a period the water which has separated to the bottom is slowly run off to the save-all tanks.

There are many methods of cooling fats, either mechanically or manually, but in all cases, to avoid separation of the oils, it is necessary to agitate the product continually until it is sufficiently cool to run into drums or casks.

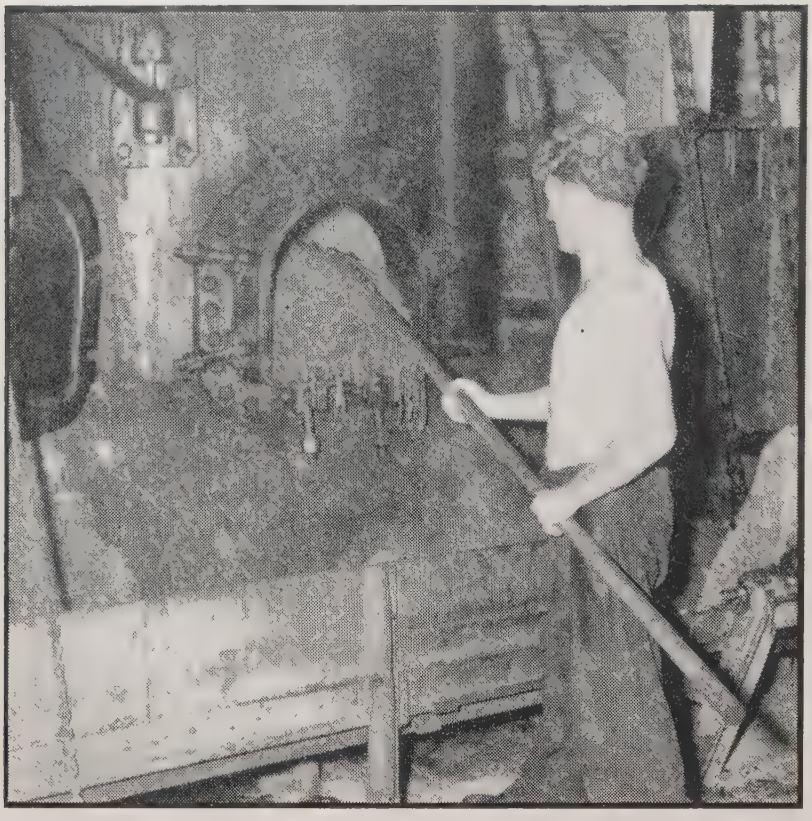
Neatsfoot Oil

The trotters or shins and feet of sheep, lambs, and cattle are cooked in a digester in much the same manner as other materials. After cooking, the contents are kept hot and left to settle for a few hours, when water is introduced into the digester to float off the separated oil to storage tanks. Any impurities that may be still in the neatsfoot stock are left to settle and are later drawn off.

In the storage tanks the oil is left to "seed" or "grain" in a low-temperature room. At the correct temperature the heavier fats crystallise and solidify while the oil remains liquid. This is known as seeding or graining, as the stearine takes on a seedy or granular appearance.

When the fat is seeded it is stirred up and run into filter bags. Pressure is exerted on the bags to force out the pure neatsfoot oil and leave the solid stearine in the bags. Maintaining the correct temperature is important to separate only the pure oil from the stearine, which runs into holding tanks from which the drums are filled. The stearine remaining in the bags may be pressed again to yield a second flow of pure oil or may be shaken out of the bags and melted down to be sold as stearine or as tallow.

MEAT BY-PRODUCTS: FERTILISERS AND MEALS



Pulling cooked hash from the digester into the conveyer trough.

The pure neatsfoot oil is valuable for frying fish, in working up fine leather, in steel cutting, and in oiling delicate machinery.

Oleo Stock

Oleo stock is not commonly packed in New Zealand. It is rendered from caul and crown fat and some of the internal organs of cattle and calves.

While a sufficient quantity of fat is being collected to render, it is quickly chilled in water, as delay will destroy the best flavour of the product. Later the fat is drained and put through a hasher, which drops it into a water-jacketed kettle or pan fitted with a mechanical agitator. A water-jacketed pan is necessary strictly to control the temperature during rendering.

During rendering fine salt is sprinkled over the fat to force down the fibre. The fat is slowly melted until it reaches 155 degrees F. and this temperature is maintained until rendering is completed. After settling for approximately an hour the clear liquid fat is drawn off into another jacketed tank, again salted, and left to settle for several hours to separate moisture and impurities, which are later removed. This product is pure oleo stock, which is later seeded, pressed, and separated to yield oleo oil and oleo-stearine.

The oleo oil is used in the production of oleomargarine, as it has a high vitamin A content, and the oleo-stearine is used in confectionery as a filler or as a hardening constituent of certain lard substitutes.

Quality of Fats and Oils

All fats and oils are periodically tested by laboratory analysis as a guarantee to the buyer and a guide to the packer. The four important terms in the manufacture and sale of fats and oils are titre, free fatty acid content, moisture, and impurities or foreign matter.

Titre is the temperature point at which the separated fatty acids crystallise or solidify and is an indication of hardness. Hard fats have high titres and liquid oil low titres. Titre indicates to a soapmaker whether the resulting soap will lather easily. Edible mutton tallow is the hardest fat, having a titre of 47 to 48 degrees C. in comparison with that of edible beef tallow of about 45 degrees C. and of inedible tallows of under 44 degrees C.

Briefly, free fatty acids determine the quality of the fat or oil. In the live animal the fat is neutral; that is, it has no free fatty acids, but immediately after killing chemical action which takes place frees the fatty acids. This action is further accelerated by contamination of the raw materials.

Moisture content between 0.28 and 0.36 per cent. for fats and under 0.10 per cent. for oils is considered ideal and is a good indication of carefully prepared products.

Foreign matter should be nil or a very slight trace.

The products of animal fats and materials are further processed or used as such for many purposes, namely, confectionery, cosmetics, oils and greases, candles, gelatine, tar, cooking, metal polish, textile finishing, and leather working and dressing.

FERTILISERS AND MEALS

When the various offals are rendered down and the tallow or oil is drawn off, there remains a cooked hash or, in the case of fat, cracklings. These become by-products of fats and oils, the outlet for which is provided in the form of fertilisers and meals. This is very desirable, because to some extent it is returning to the farm in various forms some of what has been taken out. Whether these cooked materials are further processed into fertilisers and/or meals largely depends on the type of plant available at the particular works. The packer will, if possible, produce from the materials available meals in preference to fertilisers, because animal feeds command higher prices and are of greater value to the farmer in that the high food value of the meals is used directly by the animal, thus giving the farmer greater control of diet and subsequently growth of the animal. This in particular is a desirable feature in cattle, pig, and poultry farming, and today, with a ready market for these products, it is the aim of each works to pack the best possible products of the available materials.

Dried Blood

The blood is conveyed from the killing floor by gravity or force by various means to the rendering department, where it runs into an open tank. Here it is cooked by live steam until it coagulates, which takes about 20 minutes, depending on the type of tank and steam feed. After cooking, the water is drawn off and the solid blood removed. This usually is pressed to reduce the moisture content before it is passed into steam-jacketed mechanical driers. The product then becomes a dark-red powder which is ground up and bagged.

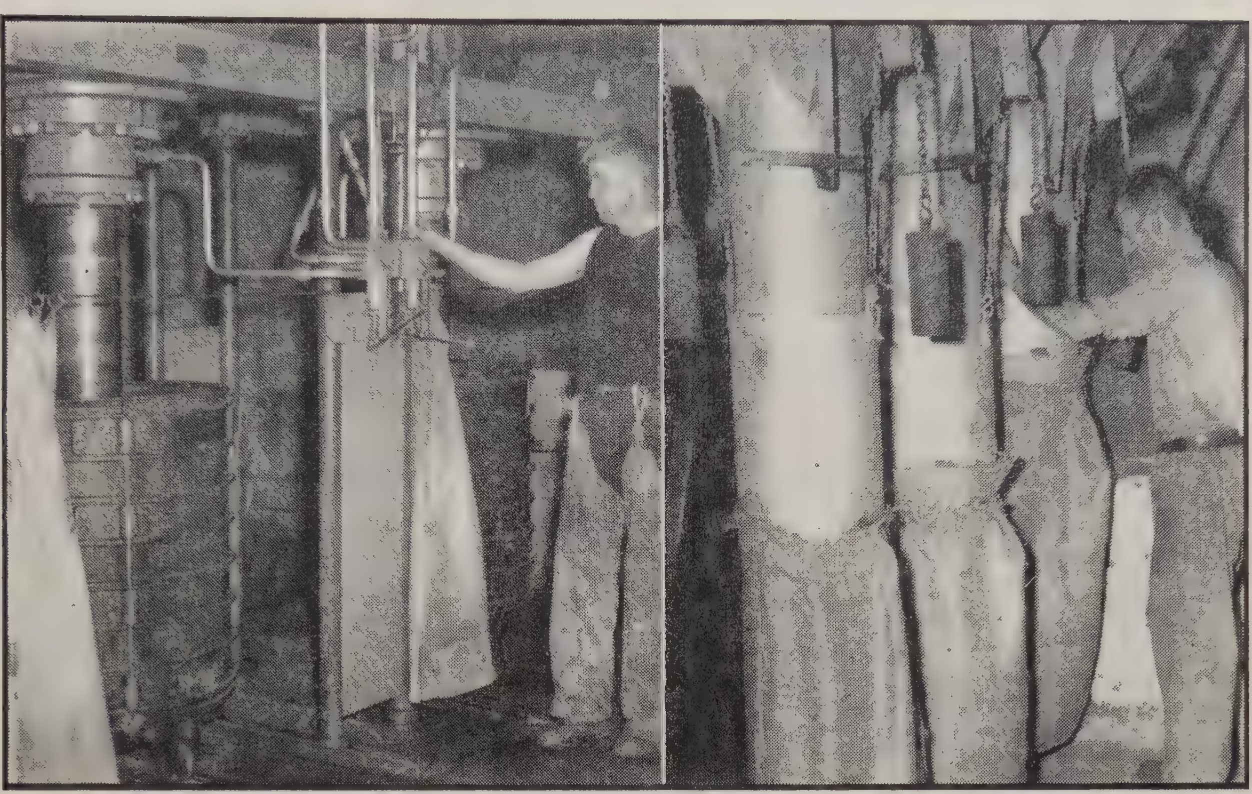
Blood as a fertiliser is valuable for its nitrogen content of approximately 13 per cent. and as a meal the high protein content of about 80 per cent. makes it an excellent ingredient in mixed feeds.

Liver Meal

Liver meal is a product which depends to a large extent on correct handling and selection of the raw materials. It is made up from lungs and rejected or condemned livers of cattle, sheep, lambs, and pigs. These offals may be steam rendered and dried in a dry-rendering machine or cooked and dried in 8 to 10 hours by the dry-rendering process. The powdered product, which is brownish red, is finely ground up and bagged. Liver meals usually carry a guarantee of having not less than a 65 per cent. protein content.

Meat Meal

All soft tankage remaining in the digesters after cooking and removal of the tallow may be processed into meat meal. The composition of these soft materials depends on what other meals and fertiliser may be packed at the



Left—Pressing surplus fat and moisture from meat meal in buckets by hydraulic presses. Right—Filling milled blood and bone manure from hoppers.

plant, as these must absorb some of the materials which might well be put into meat meals. As a result of this, each packer will have his own way of processing this product, but in the final analysis the meals may be very similar in that they have not less than 60 per cent. protein content.

The digester tankage is pulled out of the digesters and the surplus moisture and fat removed by a hydraulic press. The tankage passes on to a dry-rendering machine, which is considered the ideal equipment for processing meals. In the fat and oil section under the heading of steam-jacketed rendering the gravy system was mentioned. Normally the water or soup which separates from the fats and oils is sent to the save-all tanks, where further fat is recovered. This soup has a valuable protein content and may be concentrated and added to meat meals to bring up any deficiency of protein. In the steam-jacketed digester the soup is used in place of water and in cooking will increase in volume by the moisture in the materials. After cooking, the soup is blown into evaporating tanks instead of save-alls and the tallow is sent to the refiners in the ordinary way.

From the evaporating tanks the soup remaining is concentrated to about a third of its original volume. The concentrated stick, as it is now called, is added as required to the dry-rendering machine with the pressed tankage and dried out. The meal after cooling is ground up and bagged. The surplus stick may be further processed to solid matter and sold as high-protein material. Where bones are part of the tankage of a digester the product becomes a lower grade meal or fertiliser, namely, meat and bone meal or part of blood and bone manure, whatever the packer desires.

Bonedust

Bonedust generally comprises all clean beef bones which have been cooked in a digester and dried in a mechanical steam-jacketed drier. The bone, which is valuable for its lime content, is milled to the degree of fineness required by the buyer.

Blood and Bone Manure

Like other products, blood and bone manure may be made up of many types of offals, but as a rule may comprise all or part of the cooked materials irrespective of their source. This tankage is pressed to remove the surplus moisture and fat and then dried. The blood, in a cooked or dried form, may be mixed with the tankage either before or after drying in a sufficient quantity to give the finished product the guarantee of nitrogen content, which is usually about 7 per cent. After mixing, it is ground up to be used as a fertiliser.

Various Other By-products

There are still a few by-products not yet covered in this article, but they play only a small part in the function of New Zealand freezing works. These are principally glue, gelatine, and related products, and only a few of all these materials which may be saved are collected. These include body hide trimmings, leg, face, and hide pieces, horn piths, sinews, and certain bones, all of which come from cattle to be processed into glue and gelatine. The raw materials are cleaned and salted down in heaps and later forwarded to firms whose business it is to process such products. Collected to a less extent are bones, horns, and hoofs for specialised processing into buttons, bone handles, hairpins, and combs.

Summary

The method of handling and processing all the by-products mentioned is governed throughout by the size and construction of the plant and its type of equipment, labour available, ruling prices, and ready markets for finished products. Each packer has his own ideas of how to make the best of the animal by-products, but today he is relying more and more on the work of the analysing chemist for guidance. The chemist can minimise waste, maintain the highest possible standard of the products, and work with the aim of helping to produce better products in a more efficient manner.

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Control of Soft Wax Scale on Citrus Trees

SOFT wax scale, *Ceroplastes destructor*, which is regarded as a serious pest of all kinds of citrus trees in parts of Australia, has now become firmly established in many commercial orchards at Kerikeri, Bay of Islands County. A limited number of citrus trees in home orchards at Devonport, Auckland, have also become infested in recent years, but so far infestation appears to be confined to these two areas. The results of tests made at Kerikeri last year to determine the efficacy of D.D.T. in controlling the pest are described in this article by P. Everett, Orchard Instructor, Department of Agriculture, Auckland.

THOUGH efforts are being made to eradicate soft wax scale at Devonport to prevent its spread to commercial citrus areas, similar efforts at Kerikeri have proved unsuccessful, mainly because of the large number of infested trees. Consequently it has become necessary for citrus fruit growers in the infested areas to adopt control measures each year. This pest should not be confused with hard wax scale (*Ceroplastes sinensis*), which is common on citrus and other trees throughout New Zealand.

A series of spraying tests for the control of soft wax scale was conducted at Kerikeri in 1940 by the Plant Diseases Division of the Department of Scientific and Industrial Research, in conjunction with the writer, and these tests indicated that good control could be secured by thoroughly spraying infested trees twice each season with summer spraying oil at a dilution of 3 per cent., the first application being given about mid-February and the second about 14 days later. This spraying programme, where adopted in commercial orchards and where complete spray coverage was secured, has resulted in good commercial control of the pest.

An Australian report (p. 634, "The Agricultural Gazette of New South Wales", December 1, 1947) indicates that a period of 4 to 6 weeks elapses from the hatching of the eggs until the young scales settle permanently. The possibility of securing good control during this period of development by the use of D.D.T. at a cost very much less than that of making two applications of 3 per cent. summer spraying oil was considered worth investigation, and the test described below was conducted at Kerikeri early in 1949.

Orchard Tests

Two orchards of New Zealand grapefruit trees in bearing were selected, both orchards being fairly generally infested with soft wax scale. The test blocks in each orchard were divided into 6 plots, 3 for tests and 3 for checks, and the number of trees in the different plots varied from 14 to 27. All test plots were sprayed with D.D.T., 1lb. of a wettable powder containing 50 per cent. of active ingredient in 100 gallons of water being used. All check plots were sprayed with summer spraying oil emulsion at a dilution of 3 parts of emulsion in 83 parts of water, which resulted in the spray containing 3 per cent. of oil. All spray applications were made with a portable power sprayer, 6-nozzle brooms being used and operated at a pump pressure of 425 to 450lb. per square inch, which ensured complete coverage. The following table shows the number and dates of applications to the various plots:—

Test plot	Date sprayed	Check plot	Date sprayed
A	21/2/49	A	21/2/49
B	3/3/49	B	16/3/49
C	21/2/49	C	21/2/49
C	3/3/49	C	16/3/49

On the date of the first spray application there was a heavy infestation of scales in every plot, all in the "young star" stage of development, and emergence of the young scales appeared to be practically completed for the season. Before the second application of D.D.T. on March 3, many of the young scales had commenced to produce their waxy covering, which affords some protection against insecticidal sprays.

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Results of Tests

Little or no control of soft wax scale was secured in any of the test plots and there was moderate to heavy general infestation at the final inspection on May 19.

The degree of control secured by the use of summer spraying oil in one of the orchards where the tests were conducted was as follows:—

Plot	Dates spray applied	Degree of control secured
A	21/2/49	Good commercial control
B	16/3/49	Moderate commercial control
C	21/2/49 16/3/49	Excellent commercial control

In the orchard in which the above results were obtained the test plots were separated from the check plots by a dense shelter belt about 20ft. high, and this appeared to be fully effective in preventing the spread of soft wax scale from the test plots to the check plots. In the other orchard there was no shelter belt between the test and check plots, all being part of the same orchard block, and there was considerable spread of the pest in the "young star" stage of development from heavily infested trees in the test plots to the nearby oil-sprayed trees which were in check plot A. As the degree of control secured in check plots B and C was the same in both orchards, there can be no doubt that the considerable infestation observed in plot A was the result of reinfestation from nearby trees.

Extent of Reinfestation

The extent of infestation in which reinfestation occurred in this test and the distance the infestation was from the source are worth attention. The trees were spaced 22ft. apart on the square, and the amount of reinfestation which occurred on the first, second, and third rows respectively from severely infested trees was heavy, moderate, and very light. It is probable that the young scales were carried from tree to tree by wind.

Although D.D.T. failed to effect any appreciable control of soft wax scale in these tests, a good commercial control was secured by one application of summer spraying oil at a dilution of 3 per cent. oil when applied on February 21 and an excellent control was secured by repeating the application on March 16. Where only one oil spray application was made on March 16 the degree of control secured was only moderate.

As a result of observations made during the period of the tests the following recommendations are made for the control of soft wax scale:—

1. To permit complete spray coverage, lightly prune all citrus trees that are dense with foliage.

2. Spray all infested and adjacent citrus trees with summer spraying oil diluted to give 3 per cent. of oil in the resultant emulsion. Make the first application between February 20 and 24 and repeat 10 days later.

Dates of application, correct dilution of the oil, and complete spray coverage are of the utmost importance.

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SHEARING SHED HYGIENE

LARGE numbers of sheep have to be shorn as rapidly as possible annually in New Zealand. The fleeces are a year's growth of wool and consequently carry a year's accumulation of dirty and potentially infective material. Some essentials in shearing shed hygiene are discussed in this article by A. D. M. G. Laing, Assistant Director, Livestock Division, Department of Agriculture, Wellington.

SOME skin cuts of varying sizes are unavoidable during shearing, and, particularly with modern shearing machinery, some superficial bruising cannot be avoided, with the result that resistance to infection is lowered. In addition, as the years go by, infection inevitably accumulates in sheepyards and shearing shed surroundings. Proper hygiene at shearing time will become more necessary as time goes by. It is unlikely that any drug will ever be developed which would eliminate shearing by causing a break in the wool such as is caused occasionally under natural conditions by a serious constitutional disturbance to the sheep.

Important infective conditions which have to be guarded against are:—

Blackleg and similar acute septic poisonings are caused by organisms found in the soil, particularly where sheep have been frequently held in large mobs, in sheepyards, etc. Death is rapid after the onset, and the area round the cut or bruise which has been the avenue of entrance of the infection is usually swollen, puffy, and deep dark purple. Any veterinary surgeon or Stock Inspector will arrange for material from suspected cases to be diagnosed at Wallaceville Animal Research Station.

Inoculation at least 3 weeks before shearing is reasonably effective. Veterinary surgeons and Stock Inspectors will explain the procedure. Inoculation must not be regarded as a substitute for care at shearing.

Caseous lymphadenitis is referred to as "C.L.A." or "lympho" in the works killing sheets. The causative germ is in the soil, particularly in sheepyards, etc.

Infection results in swollen glands, mainly in the groin, the buttock, in front of the stifle, and in front of the shoulder. These ultimately discharge pus and so spread the disease, which is only rarely fatal. There is substantial economic loss, however, as carcasses with "lympho" infection cannot be exported.

There is no treatment for the condition; it can be prevented by sound hygiene in all sheep operations in which wounding is likely and by thorough culling of animals with swollen glands.

Hygienic Methods

Hygienic methods at shearing may be discussed under several headings:—

Mustering

Dirty, dusty routes to the shed should be avoided as far as possible. Shearing should be arranged for a time when the weather promises to be suitable.

Yarding

Ideally, sheepyards should have concrete floors which could be thoroughly cleansed and even disinfected as and when desired. If floors are not of concrete, as much superficial dirt as possible should be removed before the yards are used and water should be sprinkled at frequent intervals to lay dust. Yards should be inspected for splinters, rusty nails, or other materials which would cause wounds before sheep are penned.

Shearing Shed

All floors and approaches should be scrubbed thoroughly with water (hot if possible) in which 10 per cent. of washing soda (about 1lb. per gallon) has been dissolved. Floors should be swept and cleaned in this way when practicable during shearing. Spraying at intervals with one of the quaternary ammonium antiseptics at a suitable strength is sound practice.

All windows in the shearing shed should be cleaned thoroughly, as good lighting will assist the shearers materially in avoiding cuts on sheep.

Particular attention should be paid to the counting-out pens and the chutes leading to them where the shorn (and wounded) sheep first go after shearing. Even if it is not possible to have concrete flooring elsewhere, it is most desirable that these pens at least should be concreted. Counting-out pens should not be allowed to become overcrowded.

Shearing

It is desirable to shear the younger sheep first, and ewes and lambs should be separated for as short a period as possible.

All shearing implements should be thoroughly disinfected before use. Dipping them in boiling water with 5 per cent. of washing soda (about ½lb. per gallon) added is excellent. During work a solution of 3½oz. of caustic soda to 1 gallon of water (2 per cent.) will remove gross dirt and grease from implements, which should then be dipped in pure water, dried, and oiled.

Where shearing instruments have become soiled with pus from an abscess they must be cleansed as described before further use.

It is impossible to treat all cuts, but any large cuts, particularly in the lower parts of the sheep which may come in contact with the ground, should be treated. An antiseptic solution at approved strength should be squirted on to the wound with a pressure oil can (sterilised by boiling before shearing starts) or similar instrument, such as the old-type kettle drencher. Swabs or brushes must not be used, as they rapidly soil and carry infection.

Above all, avoid tar. It has no antiseptic effect and it ruins the wool with which it comes in contact.

When the value of the sheep being shorn justifies its use, sulphonamide in powder form (obtainable from or through veterinary surgeons) can be blown or puffed with a suitable blower on to wounds. Finally, when the sheep is shorn, care should be taken to see that it goes out through the hatch in such a way that it lands comfortably on all four feet in the counting-out pen and so avoids getting dirt into any wound.

After Shearing

When driving the sheep back to their normal pastures dusty, dirty routes should be avoided. Common sense dictates any special action which adverse weather conditions may make necessary.

Of all the farm animals the sheep is the least resistant to any septic infection, and it is suggested that precautions on the lines advised should be taken as far as they are economically justified. Every farmer must, of course, judge for himself to what extent any expense gone to is justified. A fact which should be borne in mind, however, is that if infections are present on a farm and are giving trouble, the longer reasonable hygienic precautions are delayed the more extensive these will ultimately have to be.

GLENARAY STATION, SOUTHLAND

Upper left—Bush Hut, one of the 14 musterers' huts on Glenaray station. Upper right—Carting out hay for sheep feed. At left—The manager's residence. Lower left—Hoggets on run-off at hay racks. Lower right—Cutting peat. Two of the musterers' huts on Glenaray are near fairly extensive peat bogs and peat from them, after being dried, is used for fuel at the two huts.

HEADING PHOTOGRAPH: Wethers being moved off chou moellier at Glenaray.

A SOUTHLAND TUSSOCK RUN

By W. FAITHFUL, Fields Instructor, Department of Agriculture, Invercargill.

GROWING wool is a matter of particular importance not only to New Zealand but to countries far beyond it, where famine and lack of adequate clothing unfortunately are often the rule rather than the exception. This article describes sheep farming for wool production on a tussock-land run, Glenaray, which is virtually a small community. Glenaray is a Southland run of about 112,000 acres, consisting of 110,000 acres of tussock and bush and 2000 acres of ploughable land devoted to rotational grass and crop. The property carries about 13,500 breeding ewes, 8500 wethers, 8000 hoggets, and almost 1000 head of cattle. The growing and feeding off of supplementary winter feed require very careful planning and efficient application and tend to complicate management.

OF the 3¼ million acres occupied in the Southland Land District some 1 1-3 million acres are tussock country; a further 1 1-3 million acres, much of which was previously in tussock, has been ploughed for crops and pastures.

Most of the runs in Southland are in the higher and more remote parts of the district and access is often difficult; in some instances the only means of approaching homesteads is by boat. It will be realised therefore that some of the problems connected with the management of these areas are not encountered in the management of the more "orthodox" sheep farm. Two very obvious differences are the extent of country involved and the range of altitude, which may be anything from low foothills to the region of perpetual snow.

The successful management of a sheep run calls for keen organising ability together with an appreciation of the carrying capacity of tussock land to "do" sheep well without either overstocking or understocking. Continuous overstocking is of course the greater of the two evils, as its effects are cumulative; understocking can be rectified, and is sometimes advisable. The effect of understocking is usually noticed more particularly in the financial return. Some blocks of tussock will often stand heavier stocking than others, and it is in such cases that good judgment is essential and the capacity of a good head shepherd or manager to assess this accurately is fully appreciated.

Although the carrying capacity of tussock blocks often varies considerably from time to time, the over-all carrying capacity of the run is fairly stable; and this figure is decided by the number of stock that can be successfully wintered. This, of course, applies to all types of farming, but it is particularly important with run country.

Wintering

If the average farmer finds that he is short of winter keep for his stock, he can usually manage to buy in feed or buy grazing from others, but with the sheep run this is usually impossible or impracticable, as often there is little or no country that can be utilised for the growing of any winter feed, and reliance, therefore, has to be placed upon the lower-altitude "winter blocks" for the maintenance of the stock during this critical period; so this problem of wintering looms large in the mind of the runholder.

Glenaray

Just as there is variation in the soil type, management, and production of various farms, so there is variation in the management and production of sheep runs. Some blocks of tussock will carry more than others; some runs have little or no country suitable for the growing of supplementary feed for the wintering of stock, but there are others where provision can be made for winter fodder and these have a higher over-all carrying capacity. Glenaray is one of the runs where special winter feed can be grown.

Glenaray is one of the largest runs in New Zealand. The homestead is situated in picturesque surroundings 11 miles to the north of the township of Waikaia and is approached by road along the fertile valley of the Whakaea River. The elevation of the country varies between 700ft. at the homestead to 6000ft., the highest point in the Garvie Range, which constitutes part of

A SOUTHLAND TUSSOCK RUN

The homestead at Glenaray.

the property. Of the 112,000 acres in the property approximately 40,000 acres are in bush, and the "quality" of the tussock may be judged from the fact that 30,000 sheep are carried. In addition it carries 400 breeding cows and 14 bulls to maintain the supply of cattle. There are also a substantial number of brood mares, pack horses, and hacks, besides miscellaneous stock including utility horses and milking cows.

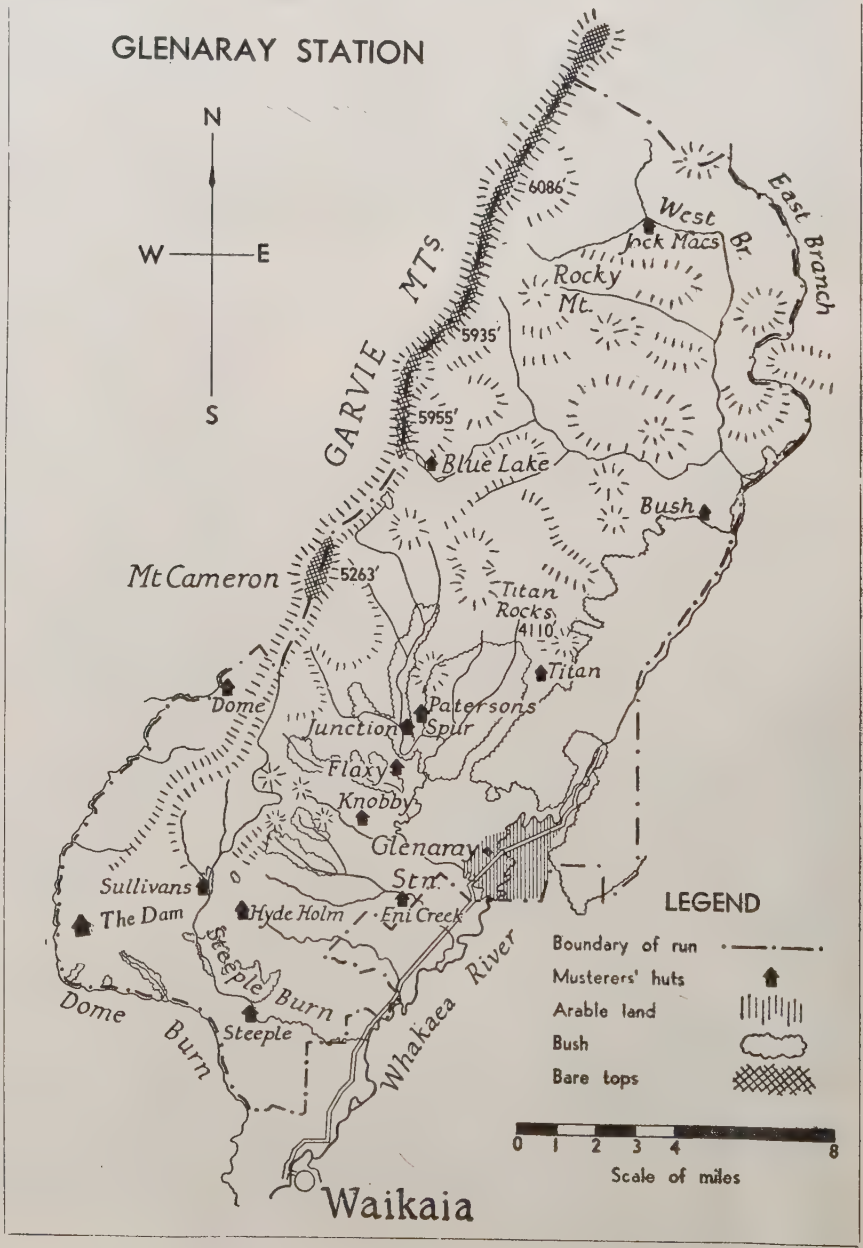
Accommodation

In addition to the homestead, manager's house, cookhouse, and single men's quarters separate houses with sections are provided for nine married couples. A particularly interesting feature of the employment of married couples at Glenaray is that the original Glenaray School was established by Mr. George Pinckney, the previous owner of the run. The school was taken over by the Education Department many years ago, but even today most of the pupils are children of Glenaray employees. In addition to the accommodation already mentioned there are 14 musterers' huts, 3 of which are in the high country. The huts are named, the name usually being indicative of the situation; thus "Blue Lake" hut is situated on the bank of a lake of intensely blue water and "Titan" is situated at the base of the Titan Rocks. Others have a historical association, such as "The Dam", which is the on the site of a dam constructed in the old gold-rush days, and "Jack Macs", named after a boundary rider of the early days.

History

A few years ago a very comprehensive and informative series of articles on the southern runs was written by Herries Beattie and published in "The Southland Times". In most instances the history of each run was traced back to the time of the Waste Lands Board which was set up in Dunedin in 1853. This board dealt with all applications for pastoral land in the country outside the original Otago block. When dealing with the Glenaray run Mr. Beattie says: "This run is No. 328 on the register, but the collector does not know much about it"; and there appears to be some confusion as regards ownership until 1871, when, to quote the collector again, "the run was included in the Southland Land District and in 1874 John McKellar gave Wm. Boyer an order for 45,000 feet of good birch timber to build the Glenaray wool shed".

The more recent history of Glenaray is more definite. The run has been owned by the Pinckney family since 1898, and from the time it was first taken over a long-sighted policy has been adopted to develop and improve it. A feature in implementing this policy was that the previous owner, Mr. George Pinckney, who was recognised as one of the most able managers of tussock country in New Zealand, lived on the run and was closely associated with its administration right up to the time of his death in 1948. From 1930 Glenaray was managed by Mr. George Pinckney and his nephew Mr. H. W. Pinckney jointly and since 1948 Mr. H. W. Pinckney has been in sole charge.



Type of Sheep

Although the production of wool is of paramount importance to the runholder, other factors have also to be taken into consideration when deciding upon the type of sheep from which it is intended to breed; it is sometimes necessary to make alterations in policy. The aim at Glenaray has been to breed a sheep that will suit the type of country, that will produce a fleece as fine as possible, and yet, having both these characteristics, will be attractive to the sheep farmer on the lower country who will eventually buy the cast ewes. To attain this almost dual type has not been by any means easy, particularly because sheep must be of sound constitution and be agile to make full use of the high country. The last feature is important, as the high country is available for only a limited part of the year and it is essential that the sheep turned out on it keep to the high country from choice, rather than having to be driven there continually. If, for example, the Romney influence becomes too dominant, the tendency is for the sheep to leave the high country in preference to the lower levels.

When the run was first acquired sheep were of a rather mixed breed and were found unsuitable for the proposed system of management. Immediate steps were taken therefore to effect an improvement. To standardise the type of sheep Mr. G. Pinckney introduced Merino rams, which were used until 1908, when Romneys were brought in and were used for 10 years. From 1918 to 1933 both Corriedales and Romneys were used, 60 Corriedale and 30 Romney rams being purchased each year during this period. From 1933 Romney rams only have been used. At present the Romney influence is strong, but the type of sheep being bred is fulfilling the three qualifications mentioned previously: An active sheep, producing a fine but heavy fleece, and attractive to the sheep and dairy farmer as a cast ewe.

Rams

To maintain the carrying capacity of the run and the weight and quality of the wool 450 rams are necessary for the 13,500 ewes. Rams are purchased from local breeders, as no attempt has been made to breed rams at Glenaray because it has always been found much more satisfactory to buy in good flock rams of the desired type. Rams are usually disposed of after about 4 years' use, but this is not by any means a hard-and-fast rule, as age, type, and constitution are all taken into consideration. Every year rams are inspected before any new rams are purchased and any ram, irrespective of age, which is not considered desirable is discarded; all discarded rams are used for dog feed.

Type of Wool

The type of wool being produced on any sheep run is, of course, most important, as on it depends the return from the only major source of income. There is a wide choice from fine Merino down through the half-bred and Corriedale grades to crossbred, depending upon the type of country, climate, and management of a particular run.

At Glenaray the type of wool being produced has been influenced by the same factors as those mentioned previously as governing the type of sheep. As might be expected, the wool is a fairly fine crossbred, the counts of the fleece wools being about 46's to 48/50's. The fact that it is possible to provide supplementary winter feed has a considerable influence on the type of sheep, the quality of the wool, the number of sheep carried, and other phases of management of the run.

Shearing

Shearing usually begins about November 20 with the rams, which are followed by the paddock wethers, hoggets, and hill wethers, and finally the ewes. Once shearing starts there is no break except for wet weather and the Christmas holidays. Mustering of the various blocks is done in rotation and must be organised so that there is no confusion when bringing sheep to the shed or taking them away.

After the marking muster musterers proceed to the high country and muster wethers while the shearing of the rams, paddock wethers, and hoggets is proceeding. While the hill wethers are being shorn the ewes and lambs are being mustered on the various blocks and are brought in. Lambs are drafted off, and while ewes are being shorn lambs are being wigged or eye clipped, two machines being kept busy in the yards on this work. Through eye clipping, wool blindness is avoided; a wool-blind sheep is seriously hampered on run country in its search for feed and consequently does not thrive.

The shearing shed at Glenaray has a holding capacity of about 2000 hoggets or 1700 adult sheep, and there is accommodation for 14 shearers on the board, although this number is not employed. The shed was built in the days of blade shearing; in fact part of it is the same building for which in 1874 John McKellar ordered the 45,000ft. of good "birch" (beech) timber from Wm. Boyer. Originally it had holding capacity for only 900 sheep, but it has been extended periodically.

Shearing usually begins about November 20; the illustration shows rams in the yards.

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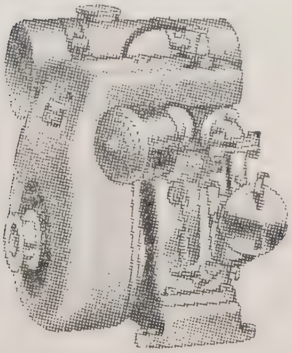

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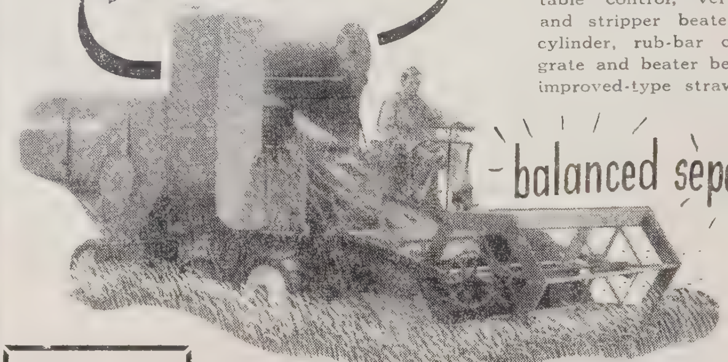

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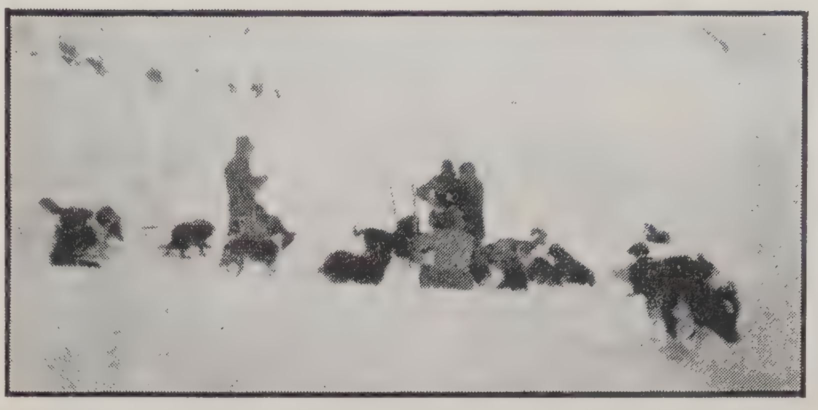
Until the outbreak of the Second World War all shearing at Glenaray was done with blades, but owing to the acute shortage of blade shearers at that time, the owners were forced to change to machine shearing and that practice has been continued. It is worthy of note that there have been no serious losses of sheep since the change-over.

Seven handpieces are used in the shed and in good weather with this number of shearers shearing takes about 8 weeks; in a bad year when there has been much wet weather shearing has extended to the end of February. Seven musterers, 1 packer, 7 shearers, 6 hands for picking up, skirting, and rolling, 2 for pressing, and 1 for penning are required at shearing. A professional wool classer is engaged every year and his services have proved valuable, as with such a large clip to deal with a much more uniform classing is possible than would be the case if this work had to be done by a less experienced person.

Disposal of the Wool Clip

The wool clip yields about 640 bales every year and is sold under the run's own mark; it has an established reputation. As is the usual custom, the wool is pressed during shearing and disposed of immediately, being transported by lorry and rail.

MANAGEMENT OF SHEEP



There is always the risk of snow.

Sheep Management

The management of the 30,000 sheep is of course greatly influenced by the general policy of the run. At the time of the autumn muster in April all sheep are put through the shed and crutched, dipped, and drafted for age by age mark. No sheep are carried beyond full mouth; at this age the cast ewes are disposed of privately and the tops of the cast wethers are disposed of for freezing and the balance wintered on supplementary feed, usually chou moellier and hay, and sold the following spring.

There is no special weaning muster at Glenaray, as any such muster would be necessary just after the ewes and lambs had been turned out to the high country; consequently weaning is also done at the fall muster. The weaned lambs are grazed in the paddocks on the flats until they are put on to supplementary feed, and the ewes go out to the tupping blocks. Any cull 2-tooths are not put to the ram, but are turned out on the low tussock country for another year and they are then put to the ram as 4-tooths.

Tupping and Lambing

There are 5 tupping blocks, which, if necessary, are all used. Rams go out as near as possible to the first week in May: The oldest rams go to the roughest blocks; the younger rams are used on the easier country. All the tupping blocks are visited periodically by shepherds and sheep rounded up. At the end of tupping the rams are drafted in yards on the tupping blocks. The ewes are then let run on the low country until shearing time.

Lambing begins during the first week in October. Ewes are kept under general observation during lambing, but this is not made a special job; the lambing percentage is 75 to 80 and all lambs are kept, no attempt being made to fatten any lambs, as all are required for replacements.

Use of High Country

As much use as possible, within the limits of safety, is made of the high country, but there is the ever-present risk of snow. By good judgment and by getting all the sheep down to the winter country before snow normally falls the risk may be minimised to some extent. Normally ewes and lambs are put out on the high country immediately after shearing, but wethers are on this country earlier, perhaps in September, according to when the snow clears. All sheep are below the snow line by the end of April.

There have been some very anxious times and some heavy losses because of snow at Glenaray; if all the sheep are on the recognised "safe" country and snow comes, nothing need be done about it, but if sheep are in the high country and snow falls in, say, April, there is serious trouble. Sheep cannot be mustered in deep snow, and snow experienced in April does not usually clear away quickly, as it normally heralds the beginning of winter. If the snow is not heavy, some mustering may be attempted, but heavy snow entails snow raking, which is the most heart-breaking of all jobs on a high-country sheep run.

Some idea of the risk of damage and loss from snow may be gained from the records of Glenaray, where in 1945 there was a loss of 3700 sheep owing to heavy snow in April. In 1939, although heavy snow was recorded, losses were comparatively light, as the sheep were all in winter country. One of the worst years was 1933. Snow fell in April and snow raking had to be done from April 20 until June 1. Between April and June 2000 ewes, 3000 lambs, and 1000 wethers were lost. In 1918 and 1923 there were also heavy snow and losses of sheep, although neither year was as bad as 1933. Snow is one of the extremely unpleasant phases of life on a high-country run, and beside being a source of heavy financial loss, snow can, in a relatively short time, nullify the work of many years.

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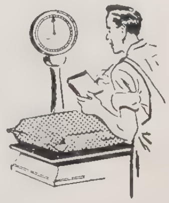

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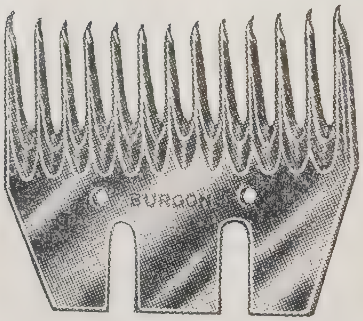

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In 1939 a survey was made by aeroplane to ascertain the condition of the sheep and cattle in snow; by this method a complete survey, which would otherwise have taken at least 3 or 4 days, was made in 35 minutes.

Health of Sheep

The health of the sheep on the hills is good, but it must be remembered that the hoggets are wintered on turnips and hay and there are approximately 8000 concentrated on the flats during winter. For many years it has been the practice to drench the sheep wintered on the flat three times—in April, at the end of May, and finally in August; this drenching minimises the incidence of internal parasites.

Foot-rot is found to be rather troublesome and there are 4 foot-rot troughs on the run, which are used continually during late winter and spring.

Wintering and Supplementary Feed

When Glenaray was first taken over there was very little flat country available for supplying supplementary feed and the sheep had to be wintered almost entirely on the low tussock country. It soon became obvious to Mr. G. Pinckney that if the carrying capacity of the run was to be increased and his general policy developed, a first essential was sufficient winter feed, at least for the young sheep; the problem was where to grow it. The obvious place was the good, fertile flats of the Waikaia Valley and gradually three farms on the flats adjoining the homestead were purchased, and at present there are about 2000 acres of agricultural land available for wintering the hoggets and some of the wethers. Full use of this land is made throughout the year, and to winter the sheep satisfactorily it is necessary to grow approximately 400 acres of swedes, hard turnips, and chou moellier every year; in addition about 200 acres are sown down to grass every year. The preparation of this land for turnips entails a great deal of work and organisation.

Swedes, Turnips, and Chou Moellier

Breaking up of the oldest lea paddocks intended for the swedes, turnips, and chou moellier crops is begun early in autumn to permit full advantage being taken of winter frosts. Cultivation of this lea ploughing is undertaken as soon as it is possible to get on to the land, and sowing takes place in November, using 4-row ridgers. As soon as the various crops are getting to the 4-leaf stage scuffling begins and scufflers are kept going, as fat-hen and spurrey are troublesome weeds in the turnip and swede crops at Glenaray. In any paddock where it is necessary to grow two turnip crops in succession the preparatory cultivation for the second crop depends a great deal on the conditions at the time; there is no set rule. If, for example, the turnips are finished early, the land may be ploughed and grubbed and worked; if the breaks are late, the paddock may be thoroughly disced and grubbed instead of being ploughed. Another factor to be taken into consideration is the probability and likely severity of club root in the particular paddock or paddocks; in some instances paddocks have been ploughed and worked and the second crop ridged in within a week with quite successful results. If possible, turnip land is given an application of up to 1 ton of carbonate of lime before the crop is sown, but here again much depends on the existing conditions, such as weather, transport, and timely arrival of lime, and, of course, the previous treatment of the paddock.

Rams being put through a foot bath.

Club root: Club root is troublesome in root crops, but it is impossible to sow the whole of the 400 acres of turnips on land ploughed out of lea; consequently about half this acreage is put in on land which has had turnips the previous season. Though a great deal of thought has been given to combating club root and many different methods of cultivation have been tried, and though experiments with anti-club root fertilisers have been undertaken and liberal applications of lime have been made annually, club root is still a very serious problem.

Feeding off: From weaning in April until they are put on the turnips, which is usually in the first week in June, hoggets graze the grass paddocks and from the first week in June until the grass begins to make some growth, which is usually in October, they are grazed on the turnips and given adequate supplies of hay. The wethers are not put on feed until some time later, depending upon the growth of autumn grass.

Pastures

The arable land on this run is of extreme importance, as not only does it have to provide 400 acres of turnips and similar crops for grazing off in winter, but reliance is placed on the sown-grass lands for supplying sufficient hay to give a reasonably balanced diet during this period of the year, when 28 to 30 degrees of frost is not uncommon and pasture growth stops. Approximately 200 acres are sown down each year, the seeds mixture used being: 15lb. of perennial ryegrass, 5lb. of Italian ryegrass (or, more recently, 10lb. of perennial and 10lb. of short-rotation ryegrass), 4lb. of cocksfoot, 4lb. of timothy, 3lb. of white clover, 3lb. of Montgomery red clover, and ½lb. of crested dogstail. The mixture may be altered according to the situation of the paddock; more timothy and less cocksfoot and perhaps no dogstail would be sown on the very high fertility flats, and other adjustments also made for some of the terrace land. Pasture mixtures are sown broadcast, usually without a nurse crop, except perhaps if the pasture is being sown in the particular paddock where the oats are being grown For many years pastures were sown in November or December, but recently it has been found more convenient, as far as organisation of work is concerned, to sow them in October, and results are equally as good as with the later sowing.

Pasture Management

No hard-and-fast rule is adhered to in liming before sowing, but if it is found practicable, the land is dressed with both lime and phosphate (superphosphate, reverted superphosphate, or, perhaps, basic slag) before the grass seed is broadcast. Topdressing with lime or superphosphate is carried out either in early spring or autumn as the organisation of other work permits; normally about 400 acres a year are treated. During and since the war it has not been possible to adhere to this programme, and though as much topdressing as possible has been undertaken during the period of shortages, some paddocks, for example, may miss being limed owing to unforeseen circumstances and will then probably receive an application of ½ to 1 ton the following year. Much depends on the condition and age of the paddock. Young grass paddocks are brought into the grazing programme as soon as practicable; there is always stock available, and in the first week in November the paddocks

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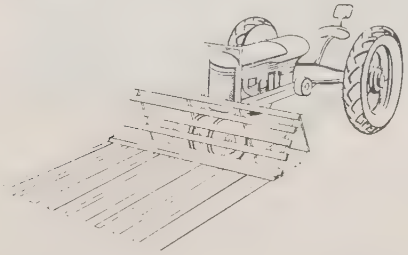

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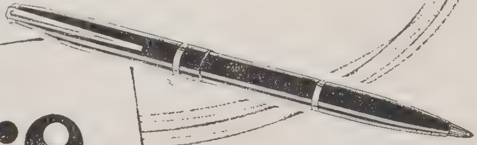

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intended for haying are closed. Usually paddocks are down for about 8 years, but this is not always possible or desirable and the age of the paddocks varies considerably according to circumstances. Some have been down for 15 to 18 years, but these paddocks are exceptional.

Hay and Oats

With the introduction of winter feeding of roots it was realised that hay was a necessity, and consequently as much hay is saved from the grass paddocks as possible; approximately 15,000 bales of hay are fed out during the winter. About 20 acres of oats are put in each year for horse feed, as despite the fact that practically all the cultivation work is done by tractors, a large number of horses is maintained on the run. In the days before mechanisation, when five 6-horse teams were kept fully occupied and a further team on contract was required to do cultivation, about 80 acres of oats were sown each season.

Cattle

The running of cattle has always been a feature of Glenaray, and in the earlier days, about the time of the gold diggings in Otago and Southland, the run is reported to have been used extensively for fattening cattle, which are said to have done extremely well and brought high prices.

At present there are about 400 breeding cows, 14 bulls, 250 yearlings, and 300 2-, 3-, and 4-year-old bullocks and 14 dairy cows (for supplying milk and butter for the staff) on the property.

Every year approximately 100 bullocks and 100 speyed cows are sent away fat. The breeding cows are all brought in off the run in October, at which time yearlings are weaned and aged cows or unlikely looking younger animals are drafted off for speying later. The bulls go out with the cows in December, and in February all the cattle are brought in and drafted; the calves are marked and the cows and calves then go out to the run, the bulls remaining in the paddocks. It is at this time that the females which were drafted off in October for disposal are speyed. By doing this a high standard of cattle is maintained and the speyed cows fatten quickly after the operation.

Hoggets on a break of turnips.

Cattle in a holding paddock before being drafted.

Breeding

Originally, all Hereford cattle were run on Glenaray, but for a number of years the type has been an Aberdeen Angus-Hereford cross. The change was made because hornless beef cattle are becoming increasingly popular (with a well-bred black poll sire the progeny are mostly hornless) and the crossbred beast fattens easily and produces good-quality beef. A further very desirable feature is that these cattle are equally as agile as the Hereford and are therefore quite suitable for this type of country. To maintain a correct balance in the crossbreeding, either black poll or polled Herefords are used as required. No bulls are bred at Glenaray, as it is found much more satisfactory to buy them in from local breeders.

Horses

Despite the advance of mechanisation in other branches of farming, the horse is still indispensable on sheep runs, and at Glenaray between 30 and 40 hacks and about 10 packhorses are required. To keep up these numbers there are 14 brood mares. A draught stallion is used on light mares for the musterers' hacks and packhorses and heavy mares are put to a light stallion for shepherds' hacks. A horse breaker is employed twice a year for breaking in the 3- and 4-year-olds, but they are all handled as yearlings. In addition to the horses mentioned there are 2 or 3 draught horses and a spring carter, which is kept for the numerous incidental jobs about the run.

Burning

Whether burning of tussock is advisable is probably the most debated question in the management of tussock country. At Glenaray the matter has been given very serious thought, and the policy has been to do some burning every year, but any burning which has been undertaken is very strictly controlled. Only the very roughest blocks are burnt, and it is so arranged that the block or blocks being burnt are surrounded by areas burnt the previous season, or steps are taken to see that fires cannot spread.

Burning is done in early September; later than this there is risk of losses in stock; for example, ewes may be lambing and could be caught in the burn if burning was carried out in October. The best burns in tussock are obtained when there is just sufficient wind to carry the fire, but a windy day is most satisfactory in dealing with tussock with an ingress of manuka. Burnt blocks carry a much heavier stocking than was carried on the same blocks before the burn, as usually the blocks that are burnt are so rough that the carrying capacity is extremely low in the unburnt condition.

Pests

Two of the most troublesome pests in this country are rabbits and deer. For the control of rabbits poisoning is undertaken whenever possible, according to the placement of the sheep, both strychnine and phosphorised pollard having been used; in addition trapping is undertaken by a full-time rabbiter.

The country is badly infested with deer, and during autumn and winter they are very troublesome and do extensive damage to the turnip and swede crops. During winter organised parties of permanent employees go out on deer-shooting expeditions and endeavour to protect to some extent the

Horses are indispensable at Glenaray.

turnip and swede blocks; but despite all efforts to control them, deer are a serious problem.

Maintenance

On a property of this size general maintenance is a very expensive item and covers a multitude of jobs. For example, every few years all the buildings, houses, sheds, stores, cookhouse, and quarters are repainted and the general upkeep of these buildings is carefully maintained. Material for maintenance of fences is an item of some magnitude, added to which is the upkeep of the many drafting and holding yards in various parts of the run. The extensive agricultural programme carried out each year is made possible only by the maintenance of an all-embracing complement of tractors, ploughs, grubbers, discs, ridgers, broadcaster, tine harrows, drill, top-dresser (500 tons of lime are applied every year); there is also a comprehensive set of implements for haymaking, including an automatic hay baler, 2 hay tedders, and hay elevator. There is also a binder and chaff cutter and 2 trucks and trailers for general carting. There is a smithy on the property to maintain all this equipment and cope with running repairs. Large-scale ordering of material used in working the run has to be done; for example, 30 gallons of branding fluid are used every year and 50 drums of dip are required for making 37,500 gallons of wash used every year for dipping. The dip is a swim type 72ft. long.

Peat

Another important item is supplies of firing. It is necessary to bring firewood in periodically for the houses, cookhouse, and musterers' huts. To gather firing for the last-named special trips have to be made at intervals during the year to haul firewood from the bush to 12 huts, but 2 others are near fairly extensive peat bogs, and peat is used for firing, Glenaray being one of the few places in New Zealand where this is done. The peat is usually cut and placed in ricks after shearing has been completed, and when the peat is dry, generally during March, it is loaded on to pack-horses or carted on light sledges to the huts and stacked.

Fencing

Fencing is of particular importance on a sheep run, and it is essential that any fencing between summer and winter country be in the best order. Two fencers are kept in steady work at Glenaray and one light tractor is used by them for transporting the material required.

The extent of the fencing is probably best appreciated by the fact that the fenceline on part of the western boundary between Glenaray and Nokomai is 25 miles long.

All fence posts used are of red beech, which is growing in the bush on the property; much of this is, however, well back, the handier trees having been used. The timber is under the control of the New Zealand Forest Service and supplies are obtained from this source upon approval.

Diary

The following diary entries indicate the more important jobs which have to be undertaken in working this tussock run.

October: The last of the supplementary feed is being cleaned up and the sheep are being drafted to their grazing blocks and paddocks. Cultivation of land for next season's turnips is proceeding. Lambing commences first week in the month. Cows mustered off the run for the weaning of the yearlings. All paddock sheep (approximately 10,000) crutched during first week. Grain sowing and sowing out. Repairs to marking yards if required.

November: Marking muster commences first week in month. Commence ridging of swedes. Shearing commences on 20th. Mustering. Maintenance of high-country fences.

December: Continuation of shearing and mustering. Continuation of agricultural work; sowing out. Scuffling of turnips commences at end of month. Maintenance of high-country fences.

January: Shearing of ewes; wigging lambs. All sheep go out to high country. Scuffling turnips continues. Haymaking commences. Peat cutting.

February: Haymaking continues. Cattle muster. Marking calves. Oats cut.

March: General maintenance, carting firewood, stacking peat, stacking oats.

April: Fall muster commences. Crutching, dipping, drenching. Annual draft of ewes and wethers.

May: Drenching of hoggets. Rams go out. All cattle to be mustered on to winter country.

June: All hoggets to go on to winter feed. Ploughing of lea. Rams taken out about 10th.

July and August: Winter feeding of turnips and hay continues. In addition to the hoggets and wethers, all the bulls, some bullocks and speyed cows together with pack-horses, foals, and the dairy cows all have to be fed and given attention. If the snow is receding in the high country the first of the wethers may be put out at the end of August.

September: Burning, poisoning; more wethers to the high country. Supplementary feeding continues as necessary.

From the diary, which is by no means detailed, and the diversity of activities which have been dealt with it will be apparent that the working of this extensive run requires careful planning and organising to ensure that production is maintained and to carry on the general policy, which combines arable farming with run-country management; in combining these two types of farming, Glenaray is probably unique.

There are also other rather exceptional features; for instance, included in the 112,000 acres are approximately 40,000 acres of standing bush, of which 12,000 acres are State forest; on the tussock runs in the drier districts bush is seldom encountered.

The breed of sheep on Glenaray is Romney type rather than Merino or Corriedale; this Romney type has proved most satisfactory for the country and the climate and conforms to three very important requirements. It is an active sheep, it produces a fairly fine wool but nevertheless a good weight of fleece, and it is attractive to the down-country farmer when no longer suitable for the run.

Acknowledgments

The co-operation given by Mr. H. W. Pinckey in supplying data and by Mr. J. Reynolds, Ardwick Street, Gore, in supplying information about the earlier breeding policy on the run is acknowledged.

Surplus of Eggs may be Countered by Reducing Production Costs

FOR the first time since the war an appreciable surplus of eggs is likely during the next flush season of production in New Zealand. Under conditions of surplus, maintaining prices is often difficult, and if to this aspect is added a rising trend in poultry-food prices, poultry producers' concern about the outlook for their industry is understandable. In these circumstances lowering the cost of egg production becomes a consideration of major importance. This article by F. C. Bobby, Superintendent, Poultry Industry, Department of Agriculture, Wellington, deals with some aspects of this subject.

Failure to cull uneconomic birds reduces efficiency. The birds marked with a circle are not worth a place in this pen of layers.

THE flush season of 1950 is likely to bring a surplus of eggs in New Zealand—in other words, the production of more eggs in shell than will go readily into consumption. To what extent this surplus will affect the marketing of eggs, both in shell and as pulp, can only be conjectured at present. A surplus of a product is always likely to affect its price, and there are indications that poultry producers fear an adverse effect on the egg market. The position may not prove as serious as some contend. Much will depend on the efficiency with which marketing is handled in the next few months.

Most poultry producers will have no control over rising food prices and only limited control, if any, over the price paid for their eggs. However, producers can endeavour to meet the situation by reducing the cost of producing eggs through the only method left to them—increased efficiency. No producer appreciates being told that he is inefficient and, indeed, few take kindly to being told that their efficiency can be increased. Nevertheless, there are inefficiently managed poultry farms in New Zealand, as in other countries, and on many farms efficiency could be improved appreciably.

Now is the time for poultry producers to take stock of the management of their farms and to explore every means of lowering the cost of egg production. Efficiency in management covers a wide field, and no producer need be ashamed if so far he has not covered the whole of that field. If he does not do so now, however, he alone will be the loser.

Every aspect of management should be considered with a view to increasing efficiency, from incubating to the handling of adult laying birds. This article reviews some of the more important aspects of management, including foods and feeding, culling of stock, and average egg production; disease control and the marketing of eggs will be the subject of a subsequent article.

Efficiency can be increased markedly by effective control of waste, ranging from infertile eggs and dead-in-shell chicks during the incubation season to the more obvious losses of food caused by sparrows, rats, and mice. A little thought will convince most producers that waste is occurring on their farms and that at least some of it can be reduced.

Standard Mashes Still Necessary

Producers cannot stop the present rising trend of poultry-food prices. With wheat costing about 10s. per bushel and mash about £18 per ton, feeding a laying bird for a complete year costs 18s. to 19s. Some producers would like to do away with the standard-mash scheme and mix their own mashes again; in particular, those with food-mixing equipment on their farms would welcome such a change. A return to a free market for bran and pollard could mean cheaper mashes for some poultry farmers, but whether the small saving in money would be worth the dangers involved is doubtful.

The bran and pollard manufactured in New Zealand are insufficient for feeding to all classes of livestock, and there is no possibility of importing from Australia either bran or pollard to make up this deficiency. These are two incontestable facts.

Consequently the poultry industry, through its Dominion conference last March, decided to retain the standard-mash scheme—a known means of controlling the distribution of pollard and bran whereby a marked priority is retained for poultry producers. If bran and pollard were again on a free market, quantities of these meals would be bought for livestock which at present receive neither. The result would be reduced supplies for poultry producers and the consequent dangers of inequitable distribution. Such conditions existed before the standard-mash scheme was introduced and without doubt would recur. That explanation is not new, but some producers still do not appreciate the present circumstances fully and are clamouring for the release of pollard and bran.

Maintaining Protein Ratio

High food prices and the necessity for a standard-mash scheme limit considerably any direct action by the producer to cut costs of production through the food bill. Using more grains and less mash does reduce costs of feeding laying stock, but not to the extent suggested by some producers. Whatever the feeding method, it is essential that the material be fed efficiently. Laying stock should receive 15 per cent. of protein in their total ration of grain and mash, so if the amount of grain (which is low in protein) is increased, the proportion of protein in the mash must be increased to maintain the efficiency of the total ration.

Meat meal is not readily available in a number of districts and supplies must be conserved as far as practicable. It is suggested that, instead of adding to the ration more meat meal than the usual 10 to 12 per cent., birds be permitted to obtain additional supplies by having this meal before them at all times in open hoppers or troughs. Heavily laying birds with the largest appetites will tend to eat this meal and benefit accordingly; inherently poorer-producing birds, which will not benefit appreciably from extra protein, are not forced to eat valuable protein, as they would be if more protein-rich foods such as meat meal and milk powders were added to the mash.

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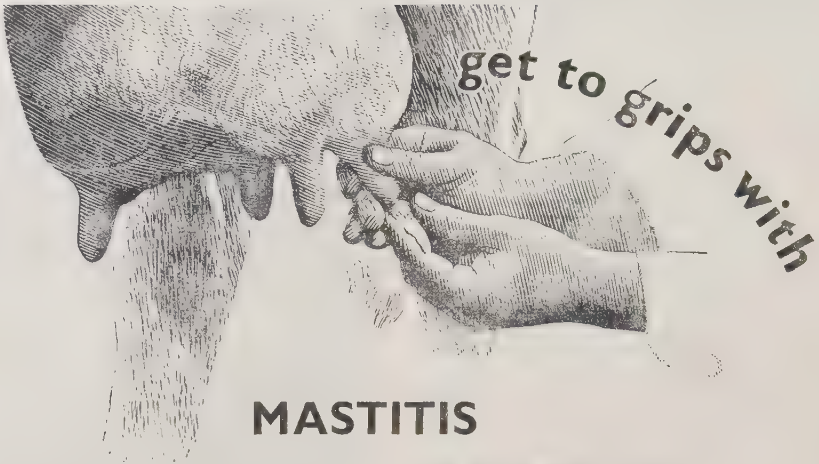

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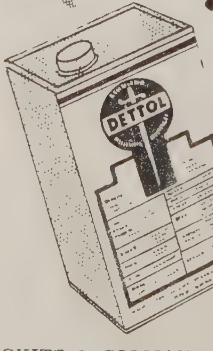

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Allowing rats and mice access to stored feed and carelessness in filling mash hoppers are two factors which increase costs of feeding and of egg production.

Greenfeed and Fish Oil

An adequate quantity of good, succulent greenfeed is essential to laying birds, and particularly to those kept under intensive conditions. Should the quantity or quality of greenfeed fall too low in winter or dry weather, not less than 1 per cent. of a fish oil rich in vitamin A should be included in the mash. Good greenfeed and oil both ensure that the birds receive vitamin A, without which there is a risk of a decline in egg production and a reduced resistance to disease.

It is proposed to publish next year the results of an experiment at present being carried out at the Poultry Demonstration Plant, Upper Hutt. Judging by results to date, this experiment when completed will demonstrate beyond all doubt the remarkable value of greenfeed and fish oil for maintaining egg production. Without one or other of these accessory foods the efficiency of the ordinary ration for laying birds is reduced markedly. That means a waste of food, which cannot be tolerated, particularly under present conditions.

Poultry farmers who feed dry mash should ensure that the type of hopper in use does not allow the birds to waste the mash. Food is also wasted if it can be eaten by sparrows by day and rats by night.

Culling and Average Production

Culling stock and raising average egg production in a laying flock are two subjects so closely allied that they may be discussed under one heading.

To many producers the term culling implies going through stock, and more particularly laying birds, at set times during the year. During the intervals the cull bird—the uneconomic bird on which money is being lost—is ignored and permitted to increase the cost of production.

No one with experience of poultry farming will deny that continuous culling throughout the year demands time, patience, and discipline. Nevertheless, efficient management calls for continuous culling of birds at all ages throughout the year and, if carried out conscientiously, will lower the cost of production on a farm.

Whether those facts are palatable or not, poultry farmers must be reminded of them, because in many cases culling is not efficient. Three reasons alone justify placing such emphasis on this aspect of management:—

A cull eats expensive food but does not give an adequate return. Many such birds do not even give a return greater than the cost of the food they eat.

Many culls are unhealthy or diseased and are a potential danger to all other birds with which they come into contact.

Culls take up space which in many instances would be occupied by profitable birds. With young stock the extra space available after culling is often of pronounced benefit to the birds which remain.

Culling of stock starts with the day-old chicks. How often does an undersized or badly hatched chick grow into a satisfactory cockerel or pullet? Such chicks do grow slowly and eat food, only to be discarded later for what they will fetch if they have not died in the meantime. A bird which is under-developed or unthrifty at any stage after being hatched rarely shows a profit and often represents a loss. Producers cannot afford to keep such birds, yet they do because stopping during the daily routine of management to catch these birds and dispose of them requires discipline and patience.

The case for removing diseased birds is even stronger. If there is doubt about whether a bird is diseased or not, the benefit of the doubt should not be given to the bird. It is easy to find producers who do not cull sufficiently and extremely difficult to find one who culls too heavily.

In view of the present high cost of production it is recommended that growing stock be culled heavily this year, only healthy and well-grown pullets being allowed to reach the laying houses. Every bird culled after it has reached the laying house represents a heavy loss, as about 20lb. of food is needed to raise a pullet to the laying stage.

The continuous culling of laying stock is equally important. A laying bird eats 8 to 9lb. of food a month, which at, say, 2d. per pound, represents 1s. 4d. to 1s. 6d. Under present conditions the poultry farmer must aim at a high average production compatible with the season of the year, and that necessitates efficient use of the high-priced food eaten. Every cull bird or poor producer means food used uneconomically. All too often numbers and not quality of stock consciously or unconsciously influence the farmer. Unfortunately, it is difficult to convince some farmers that, say, 800 good layers will yield a better profit than 1000 good and poor birds together. The discarding of 200 birds at an early stage appears at the time to be a heavy loss, but if such birds are retained, average production will be lowered and the food bill increased. Even the poultry farmer with good laying stock will benefit by watching carefully for the poorer birds and removing them without delay.

Late-maturing Pullets

With the present two-price system—a winter and a summer price for eggs—the birds which lay between February and July show the greatest profit. In most flocks a number of birds fail to come into lay within 5 or 6 months of being hatched, even under good management. Whether such birds show a satisfactory profit is doubtful, and they may be complete "passengers" in the economy of the farm.

Late-maturing stock may also moult early. If that is not so, there is a danger that they may be retained for breeding. Winter egg production is an inherited breeding character, and obviously birds which mature slowly under good management are not carrying in their "breeding make-up" that desirable character. Consequently care should be taken to ensure that they do not get into the breeding pen, either by culling them during early winter or at least by marking them with a ring to ensure that they are not retained at the end of the season.

Castration of Ruptured Pigs

SCROTAL rupture in pigs is not uncommon and presents a problem in castrating these pigs. It can, however, be overcome quite easily, and in this article, prepared by the Livestock Division, the method that should be employed is explained.

AS the occurrence of scrotal rupture in pigs is hereditary, undoubtedly the best way of dealing with it is to dispose of the particular breeding stock that is responsible and to avoid that strain in future. The allocating of the blame is not difficult; before the defect can show up both parents must carry the defect in their hereditary make-up. This does not necessarily mean that they must be disposed of forthwith, although obviously this must be considered and in no case should stock from either of the parents be kept for breeding. If ruptures occur in the litters of only one sow, commercial producers, all of whose pigs are being sold as fats, need only dispose of the sow. At the same time the boar should be marked for replacement at a convenient time by one from a different strain. Where several sows have shown the defect the boar should be changed immediately and sows when it is convenient. Replacement sows should be saved only from a sow whose litters have never shown signs of ruptures.

However, there remains the question of what to do when a litter contains several ruptured pigs, which is not uncommon. Each one of these pigs is a potential baconer, and if, by exercising a little care, they can be castrated successfully, and in many cases even the rupture cured, it is surely worth while. There are several methods of castrating ruptured pigs, but the one to be described is probably the most satisfactory for reasons that will be apparent.

How Rupture Occurs

First, it is necessary to understand what a rupture is. Normally the testicles move down into the scrotum, or purse, some time before birth. Previous to this they have developed inside the abdominal cavity. When they move into the scrotum they carry with them a portion of the peritoneum, or lining of the abdominal cavity, which forms the inner skin of the scrotum; this is called the tunica vaginalis, and all pig breeders are familiar with it. The opening in the muscular wall of the abdomen through which the testicles come down normally closes up. With a rupture, however, the closing up does not take place or is only partial.

There is generally very little external sign of the rupture when the pig is born, but it becomes apparent within periods varying from a few hours to as much as 2 or 3 weeks, the variation apparently being due to the extent of the closing up of the aperture in the muscular wall of the abdomen. The rupture is a portion of the small intestine intruding through the unclosed aperture into the scrotum, where it is present with the testicle.

In normal castration the inner skin can be cut through safely, but where there is a rupture and this skin is cut there will be a direct opening into the abdominal cavity. The following steps should be taken to prevent this occurring.

Castration Procedure

The pig should, if possible, be starved for some hours before the operation and no solid food should be given for 24 hours before it. Pigs should be operated on when not more than 3 weeks old. The animal must be held securely by an assistant, who should hold it head downward by the hind legs, securing the head between his knees.

Before any incision is made the parts affected must be carefully washed in a reliable disinfectant, as should the hands of the operator; a solution of condy's crystals is quite satisfactory. The knife blade should be flamed. After the site of the operation has been washed it is a good practice to swab it with methylated spirits or tincture of iodine. Then by manipulation with the fingers the rupture should be replaced in the abdomen and held in position by pressure applied by the second, third, and fourth fingers of the left hand. The testicle is held between the first finger and thumb of this same hand. An incision is then made in the normal position; that is, low enough to allow of free drainage of the wound.

In making this incision great care should be taken not to cut the inner skin, which should be carefully separated from the wall of the scrotum, to which it is attached by connective tissue.

Tying the Cord

The testicle, still within the inner skin, which surrounds both the testicle and the cord, is then drawn out of the scrotum. A tie is made round the cord as low down as is possible. The best material for tying the cord is suture silk or strong linen thread or a narrow piece of tape about 12in. long which has been boiled and then kept soaked in a solution of condy's crystals; on no account should an irritant disinfectant be used. The best knot to use is that known as a clove hitch or surgeon's tie. This tie prevents any portion of the small intestine from coming out and allows the opening into the abdominal cavity to repair by growth of new tissues.

When the tie has been completed the pressure applied by the fingers of the left hand can be released and the cord can be severed to remove the testicle, leaving about ½in. below the tie. After this has been done the ends of the thread or tape are shortened so that a small piece will hang down from the wound; this keeps the wound open for drainage until the tape and the portion of cord left as a block to prevent the tape slipping off have sloughed away.

In operating, the side on which the rupture occurs (double rupture is not common) should be dealt with first. After this has been done the remaining testicle is removed in the ordinary way and the wounds dressed with a suitable dressing. Sulphanilamide ointment, obtainable from any veterinary club, is suitable.

Advantages of Method

The advantages of this method are that it definitely prevents infection from gaining access to the abdominal cavity, it allows for free drainage of the wound, thus preventing the formation of an abscess, and in many cases, where the rupture is not too far advanced, it actually cures the rupture.

The method involving the removal of both testicles through one opening on the side other than that on which the rupture is situated is not advised, because frequently an abscess forms in the scrotum, owing to lack of drainage, and this leads either to the rejection of the carcass for export or to its condemnation for peritonitis, if the pig survives to reach the works. The same criticism applies to making the incision high up on the scrotum and then stitching it up. The last two methods have been used occasionally with success, but the method recommended, if carried out carefully (and this precaution applies to the castration of any animal) gives every chance of securing complete success.

Navel Ruptures

Navel ruptures sometimes occur, but they do not interfere with castration, and, provided the rupture does not strangulate, the animal usually can be fattened successfully, at least to porker weight. In the normal process of dressing the carcass the rupture is removed without blemishing the carcass.

In rare cases ruptures occur in the scrotal position in sows. The treatment of this and of the navel rupture, both of which involve the stitching up of the muscular wall of the abdomen, would have to be done by a veterinary surgeon. Because of the expense involved these cases are better left unless the value of the animal justifies it.

Bulletin Available

Full details on castration of pigs are included in Bulletin No. 230, which is available free from the nearest office of the Department of Agriculture.

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CHANGES OF ADDRESS OF "JOURNAL" SUBSCRIBERS

To ensure continuity of delivery of issues of "The New Zealand Journal of Agriculture," subscribers are required to give 4 weeks' notice of change of address. The old address (preferably an address label clipped from a recent "Journal" envelope or wrapper) and the new address should be sent to the nearest office of the Department of Agriculture.

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Christmas Gift Subscriptions

TO avoid late delivery caused by the congestion of Christmas mails, gift subscriptions to the "Journal" should be paid to the nearest office of the Department of Agriculture not later than Friday, December 1.

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HEADING PHOTOGRAPH: After rain the soil should be hoed lightly to conserve moisture; undue consolidation can be avoided if the soil is not walked on after cultivation. Sparrow Industrial Pictures Ltd. photo.

THE HOME GARDEN IN NOVEMBER

By S. O. GILLARD, Vegetable Instructor, Department of Agriculture, Auckland.

IN November weather conditions are more pleasant and there will be a noticeable improvement in the growth of vegetable plants. In the well-planned garden there is plenty of work to be undertaken. Crops will require cultivating and keeping free of weeds, which are particularly troublesome at this season, and the thinning of root crops should be attended to where necessary. In most districts the seed of swedes, carrots, peas, beetroot, spinach, and such vegetables as broccoli, cauliflower, savoy cabbage, brussels sprouts, and kale can be sown; the greens will be required for late-autumn and winter use.

TO have a succession of salad crops seed of lettuce, radish, and spring onions should be sown at regular intervals. Plantings of cauliflower and cabbage to mature in late summer and autumn may be made in November. Except in a few areas such as Canterbury and southern districts where frost is still a possibility until after the middle of the month, the sowing or planting of frost-tender vegetables such as french and runner beans, tomatoes, marrow, pumpkin, cucumber, egg plant, capsicum, squash, sweet corn, and kumaras may be continued. Plant protectors such as cloches or frames should not be removed until the latter part of the month.

Stakes and fences should be erected to support tree-growing tomatoes and runner beans and should be placed in position without delay. If staking is delayed too long after planting, the roots of the plants may be injured and undue consolidation of the soil may result through tramping it. Common methods of supporting these crops were illustrated in last month's "Journal".

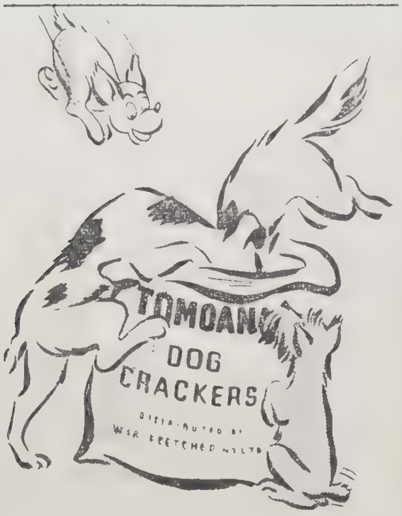
If early celery is to be grown, the beds should be prepared now. Earlier-planted potatoes can be moulded up and the main-crop planting completed. Asparagus should not be cut over an excessively long period, as this is inclined to weaken the crowns, and for a well-established bed 8 weeks is usually long enough.

Attention should be given to the rhubarb bed, as this vegetable is a heavy feeder and will benefit from applications of fertiliser during the growing season. This is best applied immediately after pulling, which should never be too severe. The heart leaves should never be pulled, as stripping all the leaves exhausts the plant by preventing its development and storage of food for further production. Newly established rhubarb plants should not be pulled during the first year and only sparingly the second season. Rhubarb requires plenty of moisture, and during dry weather will benefit from frequent applications of liquid manure.

The early onion crop will now be developing bulbs and should be kept lightly cultivated and free of weeds. When cultivating, care should be taken not to injure the bulbs, as this will seriously impair their keeping quality later. In low-fertility soils it is an advantage to apply a side dressing of nitrate of soda or sulphate of ammonia at the rate of 2oz. a square yard. If conditions are dry, this may be watered on. Early pea crops nearing maturity are liable to attack by birds, which destroy the nearly mature pods. Protection can be given by attaching strands of black cotton just above the pea rows, or wire netting can be placed over the row.

Crops of cabbage, cauliflower, and lettuce which are beginning to show signs of hearting will benefit from an application of animal liquid manure or from a liquid manure made up of 1oz. of nitrate of soda to 1 gallon of water and applied at the rate of 1 pint to each plant.

In localities where potato blight is troublesome the potato crop should be kept protected by frequent spraying. Crops planted in August or early September should have fairly well-developed tubers by the end of November. Early potatoes are best used when large enough, as they do



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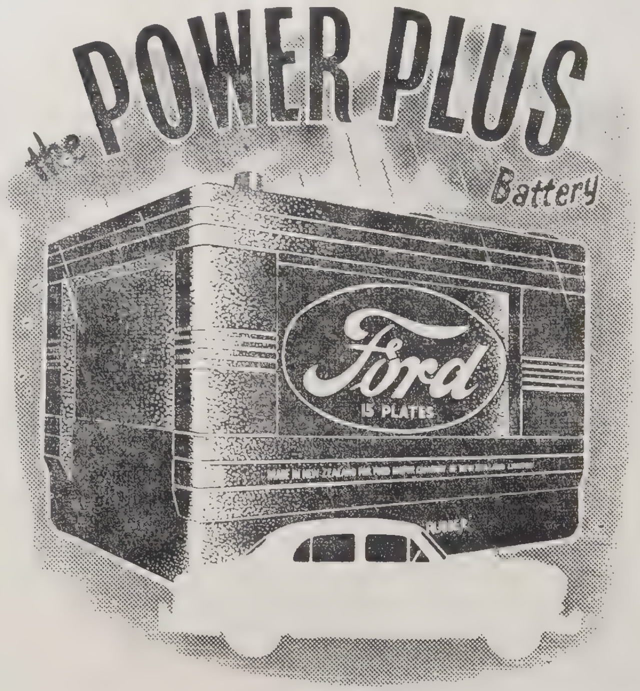

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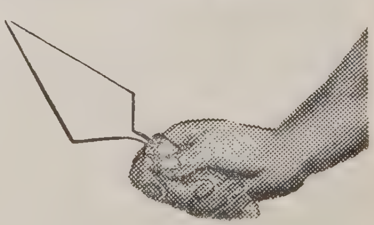

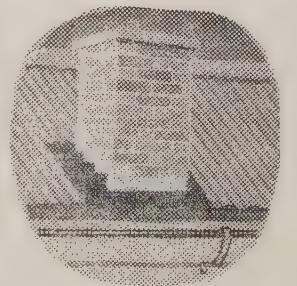

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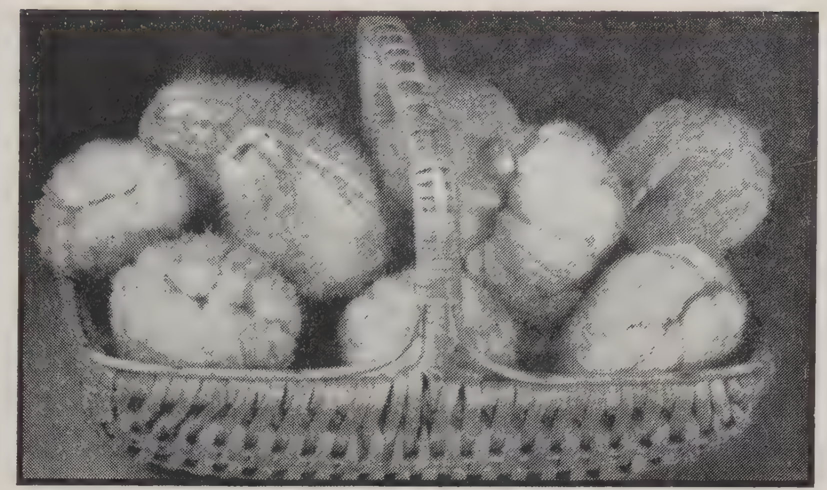
not keep as well as main-crop potatoes and are not suitable for long storage.

Choko

The choko (*Sechium edule*) is grown by many home gardeners in the North Island, especially by those who are fond of marrows and squashes When cooked the choko is very much like these in flavour. In habit of growth the choko resembles a climbing cucumber, but it has the advantage that once planted it comes into growth every season from the original root. The fruit varies in size from 2 or 3oz. to 1lb. or more and is shaped somewhat like a pear.

As the plant is frost tender and does not mature its fruit until about May, it is very doubtful whether it could be grown successfully in the South Island.

The vine is very vigorous and one established plant will produce sufficient fruit for the average household. It does not generally begin to crop until the second year. To obtain a new vine a whole fruit is planted, usually in September or early October. As the plant takes up too much space if allowed to grow like a pumpkin, it should be planted where it can climb over a shed, hedge, or similar support. There are two varieties, a white or cream fruited and a green fruited.



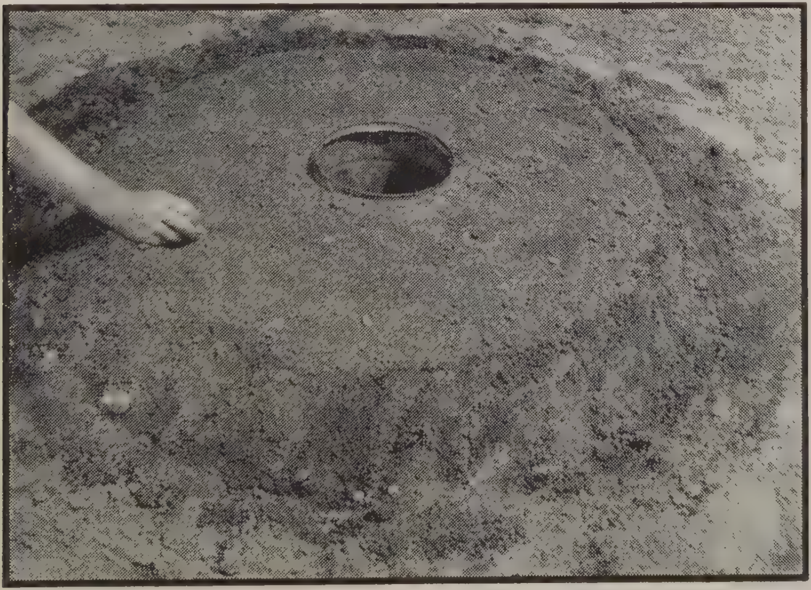
[*Sparrow Industrial Pictures Ltd. photo.*

Chokos are a valuable vegetable as they can be stored and used as required from harvest in May until the following September.

Pumpkin, Squash, and Marrow

Most varieties of pumpkins and squashes require an abundance of room. The home gardener therefore is seldom justified in devoting any portion of a small garden to these crops, because many other vegetables will give greater returns from the same area. However, in large gardens and where they can be planted after some early crop such as peas or potatoes, pumpkins and squashes are often worth growing. It is often advantageous to shelter these vegetables by growing them among sweet corn or other tall-growing plants.

Pumpkins, squashes, and marrows can be grown successfully only in localities where frosts are not experienced from October to March. The soil should be fertile and retentive of summer moisture. Soils rich in organic matter are best. The humus content of the soil can be built up by digging in a green crop such as lupin or mustard.



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Method of forming pumpkin hill. A large tin with a number of small holes in the sides into which liquid manure or water can be supplied to the plants is set in the middle of the mound. This method of manuring and watering is preferable in very hot weather, as it encourages deep rooting and the soil moisture can be maintained without wetting the topsoil or foliage, which is liable to make conditions favourable for fungous diseases, especially mildew disease. About 8 seeds are spaced around the hill; the distance away from the centre is indicated by the seed being planted.

A good practice in districts where the growing season is comparatively short is to start the plants on a hotbed in pots or boxes under glass. Pots or paper containers are best, as the plants transplant better with the soil attached to their roots. When they have been grown in boxes they should be watered before planting out and carefully lifted with as much soil as possible. After planting they should be shaded for a day or two.

When seedlings are raised under glass they should be ready for planting in 3 or 4 weeks after the seed is sown. They should be planted out promptly, as handling is difficult if the plants get too large and they may become root bound if left longer and receive a severe check when planted out. The most favourable temperature for raising seedlings is between 60 and 65 degrees F., and the plants should be hardened off by gradual exposure to outdoor conditions before they are finally set out in the garden.

Preparation of Beds

The use of well-rotted manure thoroughly mixed with the soil is recommended for beds for pumpkin, squash, and marrow, but good results are obtained if a mixture of equal parts of blood and bone and superphosphate is mixed into the beds at the rate of 2 to 4lb. to each hill. The hills should be in the form of a fairly round mound flattened on top and about 3 to 6in. high and 2ft. across. For the non-trailing types such as bush marrows the hills should be 4ft. apart. For all other varieties 6 to 8ft. spacings should be allowed. When sowing seed outside, the seed should be set 1in. deep at regular intervals around the edge of the bed by pushing them into the soil point end down. More seed than the number of plants required should

THE HOME GARDEN IN NOVEMBER

Sparrow Industrial Pictures Ltd. photo.

Yellow Crookneck squash (butternut squash) are heavy yielding and, being of a dwarf habit, do not take up much space in the garden.

be sown (usually about 8) and the plants thinned later to 4 per hill.

Apart from pinching back the tips of the main leaders of the trailing varieties to keep them compact and promote the setting of the fruits close to the bases of the plants, no attention is usually necessary other than cultivation to aerate the soil and to suppress weed growth. As all cucurbits are very shallow rooted, cultivation should be shallow.

Certain varieties of pumpkin and squash store well. Gourds for storing should be fully mature before harvesting and should be handled carefully to avoid bruising or breaking the stalk. The stalk should be shortened to within 1in. of the base of the fruit; a longer stem is more likely to be broken off or to puncture the skins of other fruits.

Recommended Varieties

Pumpkin: Triamble, Crown, Queensland Blue (Beaudesert), and Red Warren. The last variety is a good early sort, but is not suitable for long storage.

Squash: Squash varieties fall into two classes, summer and winter. The former includes Early White Bush, Early Golden Bush, Yellow Crookneck, and Goldmine. The winter class includes the hard-shelled, later-maturing storage varieties such as Banana, the Golden and Green Hubbards, and Table Queen or Acorn.

Vegetable marrow: Bush type: White Bush and Green Bush. Trailing type: Long Green and Long Cream.

Marrows and summer squashes are best picked before the seeds ripen and the skin hardens. The winter types of squash will not keep unless well matured.

Melons

Rock or musk melon: Musk melons will not cross with cucumbers, water melons, pumpkins, or squashes and differ from these in respect to their flowers, which, although self-fertile, seldom self-pollinate because of their sticky pollen. Bees are the main pollinating agents.

The female or fruit-bearing flowers are formed in the first and second leaf axils of the fruiting branches. After one or two fruits have set on a stem other flowers usually fail to develop. Pinching out the terminal shoot at this stage will generally increase the production of fruiting branches and a second setting will often result.

A comparatively light soil, such as a sandy loam rich in well-rotted organic matter, will produce earlier and better melons than a heavier soil. Musk melons require a warm soil and one in which their growth will be rapid. The plants are frost tender and the seed will not germinate well if soil and weather are cold and wet. Musk melons rarely produce good crops in southern districts unless grown under glass. Cultivation under glass is similar to that for cucumbers, except that less bottom heat is required.

Ground in which musk melons are to be planted should be prepared in the same manner as for pumpkins, but the hills should be spaced 3ft. apart in rows 5ft. apart. Wider spacings may be an advantage in favoured warm areas, where growth is more vigorous. Plants can be spaced 4 to a hill.

When the melons begin to ripen they are often protected from excess moisture by stretching a canvas sheet on a frame over them. If this is not done, the flavour may be impaired and the fruits of some of the more delicate varieties may become watery and insipid. This precaution is necessary only if the weather is very wet. Melons should be picked as soon as they are ripe.

There are a great many varieties of musk melons, but those of the netted type such as Hales Best, Benders Surprise, etc., are best for the home garden.

Watermelons: Like pumpkins, watermelons require an abundance of room, and only those with large gardens can afford space for them. They are rather sensitive to soil conditions, a sand or sandy loam is ideal. As watermelons are warm-weather plants, nothing is gained by planting the seeds early or attempting their culture in localities where the season is short and temperatures too low. Where the season is short and it is desired to try a few plants they may be raised in pots under glass and set out in a warm, sunny, well-drained situation. Good results can be obtained by digging a round hole 6in. deep and 2ft. across and filling it with manure (preferably partly rotted, fermenting stable manure), replacing the soil, and raking it down to form a round and slightly raised flat bed. When the plants are about 6in. high carefully remove them (with soil attached) from the pots and plant them 4 to a bed and shade them with newspaper for a few days. If more than one bed is required, beds should be spaced 6ft. apart.

The amateur may find some difficulty in determining when the watermelon is ripe. When the melon is immature it gives a metallic and ringing sound when tapped with the finger; when the melon is ripe the sound is muffled and dull.

Good varieties are Coles Early, Ice Cream, Klondyke, and Hawkesbury.

Preserving melons: Preserving melons are used chiefly for jam or for pies. They belong to the same species as the watermelon, but their flesh remains firm and does not change colour at maturity. Their culture is the same as for watermelons, but they are much hardier and easier to grow and produce heavier crops.

There are two varieties, Citron (red seeded) and Pie (green seeded). These are of equal merit and differ only in shape, skin colour, and colour of seeds.

Borecole or Kale

Borecole or kale, commonly grown in the cooler parts of New Zealand for greens, is a member of the cabbage family. It differs from cabbage in that it does not form a heart and has handsome curled foliage. The leaves are of good flavour and make a delicious dish. Culture is similar to that for cabbage, though borecole is much hardier and will succeed in poor soils. Plants can be raised in an outdoor seed-bed from seed sown during November, December, and January and transplanted when about 4 to 6in. high. They should be spaced 2ft. apart with 2ft. between rows. Borecole adapts itself to cold conditions and can be grown safely in southern districts. When the plants have grown to a fair size the leaves should be gathered a few at a time from each plant, eventually taking the tops or heads. Those plants from which the lower leaves were removed during the early winter will produce a crop of tender sprouts in spring.

The best varieties for the home garden are Green Curled and Dobbies Improved Curled.

WORK IN THE HOME GARDEN IN NOVEMBER

Watermelons grow quite well if a warm, sunny position is selected. The plants can be kept compact by turning back straggling vines.

Sweet Corn

Sweet corn is gradually becoming more popular in New Zealand and is a very nutritious vegetable. As sweet corn is a heat-loving plant, the hotter the summer temperatures and the more sunshine it receives the greater are the chances of success. Because of this it is doubtful whether it can be grown successfully in parts of the South Island south of mid-Canterbury, but elsewhere in New Zealand it generally grows quite well. Irrespective of district, the time of sowing is governed by the weather, but mid-October to mid-December is generally satisfactory, and if successional sowings are made, they will give a continuous supply in most districts from late January to early May.

Sweet corn succeeds on most soils. A recommended fertiliser is a dressing of blood and bone at the rate of about ½lb. to 12ft. of row, and an equal amount of dry wood ashes will supply sufficient potash. Sweet corn can be grown in hills or in rows 3ft. apart. Seed should be sown 1½ to 2in. deep and 6in. apart and when the plants are 4in. high they should be thinned to 12in. apart or 3 to each 3ft. hill. Cultivation should consist of shallow hoeing to remove weeds, and if the soil is drawn up slightly against the base, it will help to keep the plant upright.

High-quality sweet corn is obtainable only over a short period and close attention should be given to harvesting. The cobs should be pulled when the corn is in the "milk" stage—while they are juicy yet plump and firm; the tassel is usually fairly dry at this stage.

Salsify

Salsify, sometimes called vegetable oyster because the flavour of the vegetable when cooked resembles that of oysters, may be grown in almost all parts of New Zealand. The roots of salsify, although much smaller, closely resemble a parsnip, except that they exude a milky juice when broken.

Soil for salsify should be dug at least 1ft. deep and it should be well supplied with plant food. Fresh manure should not be applied at planting time, as this will result in spongy and forked roots. Seed should be sown thinly in October or November in rows 12 to 15in. apart and plants later thinned to 4 to 6in. in the rows.

As the seed retains its vitality for only a year, fresh seed should always be used; ½oz. of seed will sow a 50ft. row and this should meet the requirements of the average family.

Salsify may be harvested any time after the roots grow large enough to be worth pulling, but it is used chiefly during winter, when the roots may be lifted and stored like parsnips.

The best-known variety is Mammoth Sandwich Island.

Mustard and Cress

Mustard and cress are easy to grow even by those who do not possess a garden, as they may be grown in a backyard or a shallow box filled with soil. They will do well in any fertile soil. Curled Cress and White Mustard are very hardy and the seed may be broadcast fairly thickly and covered with ¼in. of fine soil. To ensure a succession of these vegetables seed should be sown every 3 weeks, but so that both mature at the same time cress should be sown about 5 days before mustard.

Capsicum or sweet peppers, besides being useful vegetables, are heavy yielding and give a very decorative effect to the garden.

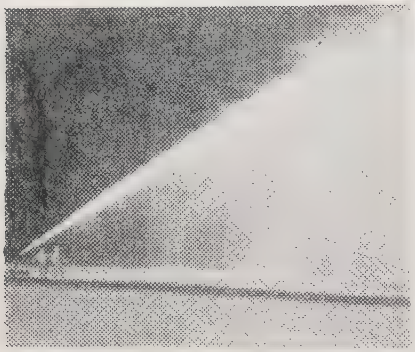
In summer, mustard and cress require a shady position and plenty of water to produce crisp and tender growth. The crop should be ready to cut in about 3 weeks and the plants should be cut close to the surface of the ground.

Recommended varieties are Triple Curled Cress and White Mustard.

Capsicum or Sweet Peppers

Capsicum or sweet peppers (*Capsicum annuum*) are warmth-loving plants and are frost tender. Although **not commonly grown, they are well** worth a trial in districts with suitable conditions. About 12 plants will be sufficient to supply the average family. When ripe they are very decorative with their deep red or green fruits and make excellent garnishing for salads. They are relished by many when baked or boiled. To prepare them for cooking the outer portion is cut around the stem, and the core with stem attached is removed. When baked the fruit is usually filled with mincemeat and chopped up onion.

Culture is similar to that for tomatoes and the plants should be raised in pots or seedling boxes under glass for planting out when danger of frost is past, usually in October or November. Before the plants are set out 2ft. apart in rows 3ft. apart the soil should receive 8oz. to the square yard of a fertiliser mixture composed of equal parts of blood and bone and superphosphate plus 1/20 part of sulphate of potash, all by weight. The ground should be kept lightly cultivated throughout the growing period. No staking or pruning is required. In most localities fruits begin to mature in March and harvesting continues



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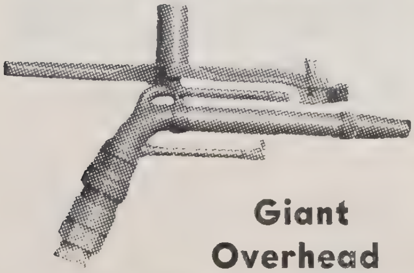

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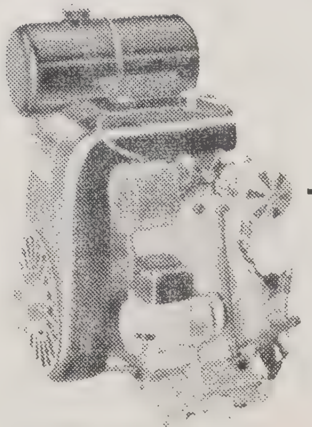

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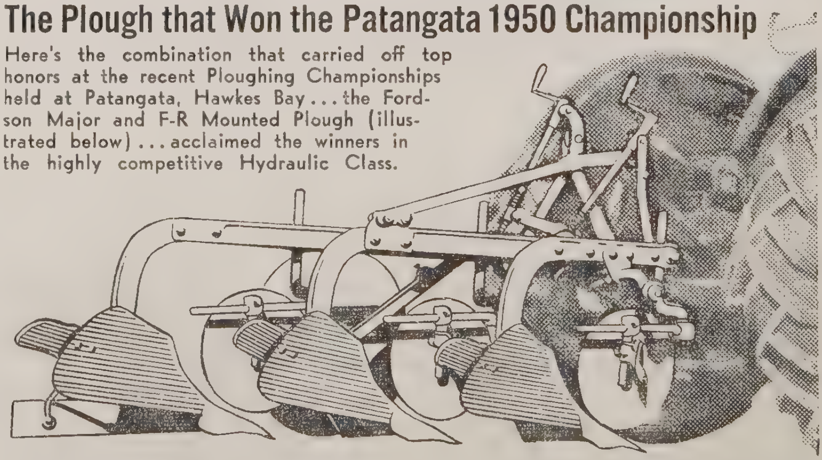

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until late May or early June. The fruit of the red type is ready to pick when the red colour begins to develop, as it is then considered to be in the best condition for cooking.

Suitable varieties are Californian Wonder and Harris Early Giant.

Silver beet (Swiss chard) is easy to grow because of its resistance to most diseases that attack green-leaf crops, and is a valuable green, as it is available over a long period.

Spinach, Silver Beet, Spinach Beet, and New Zealand Spinach

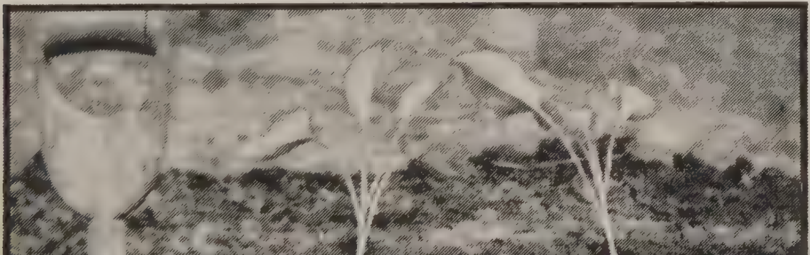
Spinach, silver beet, spinach beet, and New Zealand spinach, though different in habit are used similarly. The native New Zealand spinach, which is not a true spinach, has a sprawling habit and spreads to 3 to 4ft. across. The leaves are small, thick, silvery, and triangular-ovate. The plant is a good substitute for spinach and thrives only during hot weather, when ordinary spinach is difficult to grow.

It is harvested by pinching off about 3in. of the growing tips. This causes new auxiliary shoots to develop, so that when well established the plant has large numbers of edible tips suitable for gathering. New Zealand spinach should be given plenty of room to develop. The seed is best sown 1 to 1½in. deep in clusters spaced at least 2ft. each way. The weaker plants should be removed.

Of the true spinach there are two varieties. Round Seeded for summer growing and Prickly Seeded for winter. Spinach seed should be sown thinly ½in. deep in rows 12in. apart and the plants later thinned to 3in. apart before they crowd in the rows. For summer growing most home gardeners prefer silver beet (Swiss chard) to spinach, as it is easier to grow and is available over a much longer period. There are about six varieties, but the best are Lucullus, which is a light green variety with slight stalks, and Fordhook Giant, which has larger, dark green, broader, and more crinkled leaves and broader white stalks. Rhubarb chard, which is red, is very decorative and is of good flavour.

Perpetual or spinach beet may be used in place of silver beet, but the former has not the enlarged midrib of the latter.

Spinach and silver beet should be grown quickly to produce the crisp, succulent growth so desirable in these vegetables. The soil should be well drained and contain plenty of organic manure. Blood and bone worked in at the rate of 4 to 6oz. a square yard can also be applied, and an application of liquid manure (during dry weather) or nitrate of soda at the rate of 1oz. per square yard half-way through the growing period will be advantageous. This fertiliser must not be allowed to come into direct contact with the plant.



Incorrect and correct ways of setting out cauliflower and allied plants. Roots should not be doubled up in the hole like those of the plant at left; each hole should be sufficiently deep to allow the roots to stand their full length like those of the plant at right. Plants should be set in the ground slightly deeper than they were in the seed-bed and should be firmed by pressing soil over the roots.

Seed should be sown thinly at this time of year ½ to 1in. deep in rows 18 to 20in. apart and the plants thinned later to 9 to 12in. apart in the rows. These crops do not grow well in acid or sour soils and if excess acidity is suspected, the soil should be limed. A dressing of carbonate of lime at the rate of 3 to 4oz. a square yard before sowing is sufficient for most soils.

Celtuce

Celtuce or celery lettuce is easy to grow and combines the uses of celery and lettuce. Though a member of the lettuce family, it is entirely different in its growth. When plants are about 6 weeks old the larger leaves may be used as lettuce and 2 or 3 weeks later the central stems or stalks may be eaten raw or cooked.

When the stems are to be used the lower leaves, outer skin, and fibrous layers should be removed down to where the stem becomes light green and tender. Cooked celtuce stalks have a pleasing mild flavour suggestive of celery.

Celtuce may be grown almost the whole year round. Seed should be sown thinly ¼in. deep in rows 18in. apart and plants thinned to 12in. apart in the rows. Successive sowings at intervals of 3 to 4 weeks will ensure a continuous supply.

Winter Greens

Savoy cabbage, cauliflower, broccoli (heading and sprouting types), and brussels sprouts seed may be sown for planting out in January and February.

Savoy cabbage, which is distinguished by its crinkled leaves, is excellent for winter production in the colder districts where the ordinary cabbage will not heart satisfactorily.

Cauliflower and broccoli (heading types): Though cauliflower is similar in appearance to and has much the same qualities as broccoli, it is quite distinct from broccoli. Cauliflowers are more commonly grown and mature earlier, taking only about half the time of broccoli. The varieties can be divided into several classes according to maturity periods; 3 and 4 months (early), 5 and 6 months (midseason), and 7 to 9 months (late).

To secure cauliflower and broccoli for harvesting in succession, one planting can be made of varieties with different maturity times. Phenomenal Early, Phenomenal (5 and 6 months), and Broccoli No. 3 will mature in that order.

Recommended varieties: Broccoli (heading types): Late Metropole, Veitch's Self Protecting, and Broccoli Nos. 1, 2, and 3. Cauliflower: Early: Phenomenal Early, Early London, and Snowball. Mid-season or main crop: Phenomenal (5 and 6 months), Veitch's Autumn Giant, and Southern Cross.

Broccoli (sprouting or non-heading types): In sprouting broccoli the main head is produced terminally on a fleshy, branching, elongated stalk. In addition to the terminal head, longer, more slender, and smaller heads appear laterally in the axils of the leaves. Sprouting broccoli is much hardier than early strains of cauliflower and can be harvested over a longer period. Sprouting broccoli provides a high-quality, distinctive crop and is well worth a trial in the home garden.

Sprouting broccoli takes from 4 to 12 months to reach maturity, according to variety. Three types of the non-heading or sprouting broccoli are green sprouting (Calabrese), purple sprouting (both early and late) and white sprouting; of these the green type is most popular.

Brussels Sprouts

Brussels sprouts are slightly more difficult to grow successfully than cabbage, but if proper attention is given to spacing and the feeding of the plants, they can be grown by most home gardeners. Soil type is not important provided excess moisture is not present.

Recommended varieties are Scrymgers Giant, Fillbasket, and Champion.

With winter greens best results are obtained if the soil is rich in humus. Before planting it should be dressed with a fertiliser mixture consisting of 3 parts of blood and bone, 1 part of superphosphate, and 1/20 part of sulphate of potash, all by weight, at the rate of ½lb. to each square yard. The dressing should be followed by a side dressing of sulphate of ammonia or nitrate of soda at the rate of 1oz. per plant when the plants are half developed.

Sowing Seed

Seed of savoy cabbage, cauliflower, broccoli, and brussels sprouts should be sown very thinly ½in. deep in a well-prepared bed of fertile soil. When the young plants are about 6 weeks old they should be transplanted carefully to their permanent positions. It is important not to break the taproot in lifting the plants, and the root should not be doubled up when plants are being set out. If the weather is hot, it is an advantage to trim about a third from the coarse, older leaf growth at the top of the plant. This facilitates handling and it is generally considered that it enables the plant to establish better.

Savoy cabbage and early varieties of cauliflower should be planted 18 to 24in. apart in rows 2ft. to 2ft. 6in. apart. Plants of main-crop cauliflower, broccoli, and brussels sprouts, which cannot develop properly if crowded, should be spaced 24 to 30in. apart with 3ft. between the rows.

Other Vegetables

Advice on the culture of asparagus, beans, beetroot, carrots, cucumbers, kohl rabi, kumaras, lettuce, parsnips, peas, potatoes, and tomatoes was given in the September issue of the "Journal".

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Radio Broadcasts

THE following radio talks will be given to farmers from Station 1YA Auckland at 7.15 p.m.:—

November 1—"Silage Making," by H. M. Bull, Instructor in Agriculture, Department of Agriculture, Hamilton.

November 8—"Some Diseases of Pigs," by C. Ensor, Veterinarian, Department of Agriculture, Whangarei.

November 15—"Poultry Breeding Schemes," by S. G. Haddon, Poultry Instructor, Department of Agriculture, Auckland.

November 22—"The Breeding of Queen Bees," by R. S. Walsh, Apiary Instructor, Department of Agriculture, Auckland.

November 29—"Young Farmers' Clubs," talk arranged by the Thames District Committee, New Zealand Federation of Young Farmers' Clubs.

The following talks will be given from Station 1XH Hamilton:—

November 2—"Answers to Queries on Stock Problems," by P. J. McCann, Veterinarian, Department of Agriculture, Hamilton.

November 9—"Some Aspects of Spray Irrigation of Pastures," by H. E. Annett, Irrigation Research Officer, Rukuhia Soil Research Station, Department of Agriculture, Hamilton.

November 16—"Hill-country Problems," by H. M. Bull, Instructor in Agriculture, Department of Agriculture, Hamilton.

November 23—"Johne's Disease in Cattle," by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

November 30—"Progress in Peat Experiments," by F. B. Thompson, Agricultural Chemist, Rukuhia Soil Research Station, Department of Agriculture, Hamilton.

The following talk will be given from Station 1YZ Rotorua at 7.15 p.m.:—

November 9—"Haymaking," by A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 2YZ Napier on Tuesdays at 7.10 p.m., 2YA Wellington on Thursdays at 12.35 p.m., 3YA Christchurch on Mondays at 12.20 p.m., and 4YA Dunedin on Thursdays at 12.35 p.m.

Pig Broadcasts

Under the auspices of District Pig Councils broadcasts will be delivered in November as follows:—

Rotorua—1YZ, on November 23, at 12.35 p.m., "The Overfat Pig is not Wanted," by A. F. Barwell, Supervisor, Bay of Plenty District Pig Council.

Wellington—2YA, on November 21, at 7.15 p.m., "Pigs in the Summer," by C. M. Bailey, Supervisor, Taranaki District Pig Council.

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METEOROLOGICAL RECORDS FOR AUGUST

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum: Maximum	Minimum	Total fall	No. of days of rain	Difference from normal	Maximum fall: Amount	Date	
Kerikeri	201	51.5	+0.9	66.5	34.5	5.95	20		1.34	27	156.7
Auckland	160	52.2	+0.1	66.8	37.9	3.47	18	−1.16	0.58	3	156.2
Tauranga	10	49.6	+0.0	63.5	31.1	5.96	13	+1.22	2.95	18	191.3
Ruakura	131	46.9	−1.5	63.3	24.7	4.28	15	+0.27	0.93	28	162.4
Rotorua	980	45.7	−0.6	61.2	29.0	6.66	11	+1.49	2.10	18	146.9
Gisborne	12	48.6	−0.9	66.0	30.8	3.08	20	−0.63	0.49	6	138.1
New Plymouth ..	160	49.0	−0.6	64.2	34.1	3.88	10	−1.73	1.00	21	173.7
Napier	5	48.8	−0.1	63.6	33.7	4.50	16	+1.51	2.44	31	148.9
Taihape	2157	42.5	−0.4	59.0	26.6	3.36	10	+0.65	0.90	6	
Wanganui	72	48.2	−0.3	64.0	32.0	3.76	11	+0.99	1.28	6	149.2
Palmerston North .	110	47.0	−0.6	61.5	28.0	4.74	9	+1.39	1.29	21	124.4
Waingawa	350	45.2	−0.5	60.5	26.5	3.73	12	−0.53	1.19	21	126.4
Wellington ..	415	46.8	−0.4	56.8	33.9	5.40	16	+0.98	1.19	6	132.0
Nelson	24	46.4	−0.6	61.6	32.8	4.96	11	+1.63	1.35	3	191.6
Blenheim	12	45.4	−1.6	61.9	28.4	3.95	8	+1.66	1.70	6	170.1
Hokitika	12	44.2	−0.8	57.0	27.6	9.01	13	−0.29	3.21	20	164.8
Hanmer Springs ..	1225	38.3	−3.1	61.8	19.0	6.52	14	+3.04	1.64	31	143.9
Christchurch ..	22	42.8	−1.4	61.6	24.3	4.41	12	+2.36	2.19	30	169.6
Ashburton	323	41.0	−2.1	67.0	24.2	5.81	11	+3.58	1.46	17	179.8
Timaru	56	42.4	−1.4	63.2	24.8	4.41	9	+3.02	2.10	30	186.1
Alexandra	520	39.5	−1.7	61.6	21.7	0.98	8	+0.33	0.27	30	178.5
Taieri	80	41.8	−1.9	64.4	22.8	1.60	9	−0.35	0.44	29	154.9
Invercargill ..	32	43.1	−0.3	62.0	27.0	2.15	15	−0.88	0.47	16	115.9

The Care of Milk and Cream for Manufacturing Purposes

By R. W. NAYLOR, Farm Dairy Instructor,
Department of Agriculture, Te Awamutu.

OF the many tasks associated with the efficient management of a farm dairy and the production of a raw material of the finest quality for manufacturing purposes none can be considered of greater importance or more likely to influence the attainment of such a standard than the care or attention milk or cream receives while held at the farm dairy awaiting transport to the factory or manufacturing centre.

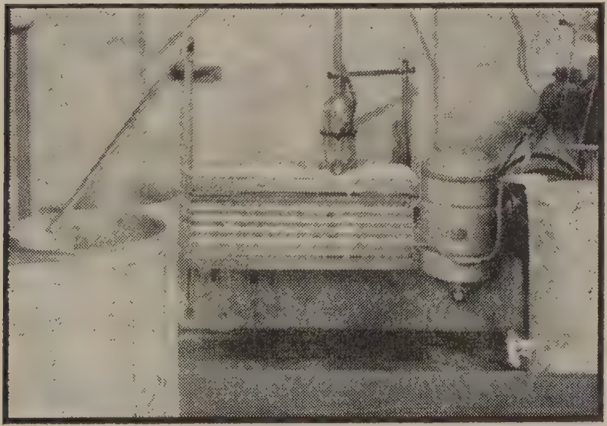
THE work involved in keeping a milking shed and its immediate surroundings in a sanitary condition and maintaining a milking plant and separator equipment in a similar state may be faithfully carried out, resulting in the production of milk or cream of high quality at the time of its release in the farm dairy, but if adequate attention and scrupulous care are not exercised in maintaining that condition, what was originally a high-grade product deteriorates speedily.

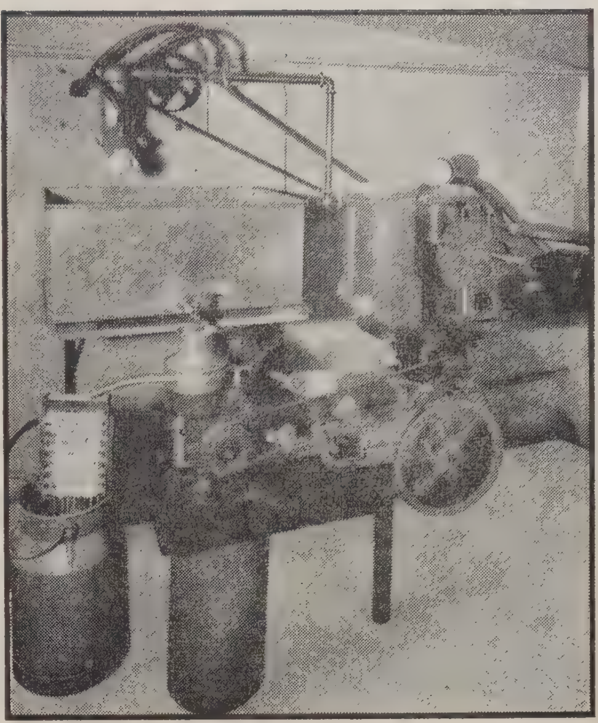
Because milk and cream are complex organic substances subject to natural decomposition, even under ideal conditions, it is obvious that the introduction and subsequent development of undesirable bacteria or the absorption of unclean flavours from whatever source must have a detrimental effect on the keeping quality and final grading of the product.

Holding Product under Hygienic Conditions

There must be facilities for holding milk or cream at the farm dairy under the most hygienic conditions. The cream or milk stand or compartment should be well ventilated and only pure air should enter it. A standard of cleanliness which will prevent the possibility of contamination by the absorption of foreign odours from an external source or as a result of unclean conditions under which the milk or cream is held should be maintained.

A milking shed should be planned so that the milk stand or separator room is on the windward end, and the immediate surroundings should be laid out to prevent the traffic of stock in the vicinity of the milk stand or separator room. Such an arrangement, particularly if the area is well grassed, makes contamination from an external source unlikely, and where home separation is done it would be quite safe to have a louvred safe or compartment built out from the separator room for the overnight storage of cream. The common practice of holding cream in the separator room is dangerous, chiefly because taints may be absorbed from milk-splashed and sour-smelling concrete, fermented areas of skimmed milk resulting from any leakage in its disposal, or from stored goods and old clothing, all of which have characteristic odours capable of absorption by milk or cream.


Milk being cooled and elevated to raised milk stand.


[*Green and Hahn Ltd. photo.*
Up-to-date assembly of releaser, cream separator, skimmed-milk pump, and cream cooler.

Too much care therefore cannot be taken to make sure that where milk or cream is held on the farm unsatisfactory conditions do not arise, and this can be brought about only by a high standard of cleanliness constantly maintained.

Cooling of Milk and Cream

To appreciate fully the value of cooling and its effect in maintaining the quality of milk or cream (and in many cases where feed flavours and other physical taints are encountered in improving the quality) the composition of milk or cream and the effect which a rapid lowering of temperature has on the bacteria content must be considered. Under normal conditions bacteria are the main cause of deterioration in both milk and cream.

Milk and cream, if not subjected to rigid temperature control, provide ideal conditions for the growth of bacteria of many and varied types. This results in rapid decomposition of the organic matter on which the bacteria feed and a corresponding decline in quality. An efficient safeguard is a cooler capable of reducing milk or cream rapidly to a temperature of at least 65 degrees F.; where the cooling water is drawn direct from its source even lower readings can be obtained.

At such temperatures the growth of bacteria is checked, any decline in quality arrested immediately, and the value of efficient cooling clearly demonstrated in the production of milk or cream capable of retaining its original flavour and sweetness.

Clean Containers

No greater or more prolific source of contamination can be found than a can or lid which as a result of persistently hurried and imperfect cleansing has a surface on which the residues of previous consignments are all too apparent,

THE CARE OF MILK AND CREAM

[*National Publicity Studios photo.*

Cream being collected from a small cool room at the farm gate.

either in the form of a yellow fat deposit or a whitish encrustation of dried-on milk deposit. Both are fertile media for the development of putrefactive bacteria and, particularly if the can is porous or rusty from lack of tinning, for the more immediate tainting of its contents by the absorption of the unclean flavour which a metal surface in such a condition cannot fail to impart.

It is only after thorough cleansing, by scrubbing with hot water and by using a suitable detergent to remove fat or milk deposits, and final sterilising with plain boiling water that cans may be considered fit receptacles for the storage or conveyance of milk or cream. One of several suitable detergents—caustic soda, plain washing soda, or some proven commercial preparation—may be chosen, but if high quality is the aim, scrubbing of the container on every occasion before use cannot be neglected.

Frequent Stirring or Plunging

The importance of frequent stirring or plunging as a means of maintaining the keeping quality of milk and cream is not recognised as widely as it should be, if the obviously unused plungers not infrequently seen in farm dairies may be accepted as evidence. There have been many cases where neglected plungers when put to proper use have been responsible for effecting an immediate improvement in quality and the resultant grading of milk and cream.

Plunging assures even distribution of fats throughout the mass of milk or cream treated. It disturbs and exposes to the atmosphere the milk serum which, because of its composition, is the principal source of bacterial development, whether of useful or harmful, natural or putrefactive bacteria. By retarding bacterial growth plunging helps to prolong the period for which the product will remain pure and sweet.

The accumulation of gases in milk and cream which are associated with seasonal growth of pasture or a result of infection by certain types of bacteria is set free by vigorous plunging, and the possibility of taint reduced considerably.

Mixing Warm and Cold Milk or Cream

The mixing of warm and cold milk or cream cannot be condemned too strongly. It provides more favourable conditions for bacteria growth in the combined product and impairs its keeping quality. If milk or cream must be mixed, it is essential that both samples should have been cooled to similar temperatures and thoroughly stirred and plunged before they are mixed.

Protection at Roadside

By no means least in importance in ensuring that milk or cream is of good quality is the provision of adequate shelter for the product when delivery is taken at the roadside, where it may remain, according to circumstances, for from a few minutes to an hour or more before being picked up and transported to the factory. Any ill effects resulting from variations in the time milk or cream is on the roadside can be overcome by providing a stand which gives ample ventilation but complete protection from the rays of the sun.

When cans are unprotected and become heated by the sun's action the quality of milk or cream is immediately harmed by contact with the heated metal, and if exposure is sufficiently prolonged, the partial cooking of the fats takes place, resulting in rancidity and the off flavour which such treatment promotes.

The practice of placing a sack over cream cans on an exposed platform or bank by no means can be termed adequate protection. Even if the surface of the can is completely covered the general rise in temperature of its contents is extremely harmful, and the covering may easily be blown aside, leaving the can unprotected.

It is therefore only by the construction of a suitable stand that dangers can be guarded against and the standard of quality of milk or cream maintained in the final stages of its production.

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DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during August, with comparative figures for the same month of last year, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

		Tons			Tons
Month	Creamery	Whey	Total	Percentage inc. or dec.	Total in store at end of mth.
August, 1950	9,111	110	9,221	—	9,194
August, 1949	8,959	106	9,065	—	11,163
Increase or decrease	+152	+4	+156	+1.720	—1,969

CHEESE—

		Tons			Tons
Month	White	Coloured	Total	Percentage inc. or dec.	Total in store at end of mth.
August, 1950	1,502	290	1,792	—	5,085
August, 1949	1,394	90	1,484	—	3,211
Increase or decrease	+108	+200	+308	+20.754	+1,874

If these figures are converted into butterfat equivalent, there is an increase of 3.069 per cent. in butterfat for the month of August as compared with the corresponding month of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

TOPDRESSING: A WAIKATO STUDY

By
A. J. PRICE,

Fields Instructor, Department
of Agriculture, Te Awamutu.

TWENTY years after the Ruakura Experimental Station had issued its recommendations for the artificial manuring of Waikato permanent pasture, a procedure which had been stumbled on by pioneers in the Cambridge district, the system had reached its logical conclusion, and the intensive all-grass farm, on which crops played no part, had become a characteristic of the Waikato.

MEANWHILE there had been a very large influx of new settlers; new land had been broken in and old estates cut up; the era of speculation at the close of the First World War had caused much trafficking in land titles; but even so there were some farms which did not change ownership, and whose owners, therefore, had witnessed the gradual evolution of the new system of farming, and perhaps had kept records of what had happened on their own properties. On investigation a number of such farms were found, and this article will deal with three dairy farms and one fat-lamb farm in widely separated parts of Waikato and Waipa Counties.

A short account of the main events in grassland development since the adoption of topdressing will, however, first be necessary, because, although topdressing was by far the most important single innovation, it brought problems in the management and utilisation of pasture which were not solved all at once and are still to some extent unsolved.

The year 1920 can be taken as the start of the modern period in the growth of the Waikato, since it was marked not only by the large-scale amalgamation under the New Zealand Co-operative Dairy Company, but also by the virtual disappearance of cash crops from the pattern of farming, as a result of high butterfat prices. Supplementary crops lingered on for a few more years until the remnants of the old browntop, chewings fescue, and ratstail pastures had been replaced and until the horses retained for cultivation and haymaking and for carting cream to the gate had been weaned off hard feed on to grass. Swedes and turnips, which were the first crops grown in the Waikato after its confiscation from the Maoris, were the last to go out because of their usefulness as feed for dairy cows and in the bringing in of new land. The table in the next column gives the figures for the decline in cropping.

The rolling country on Mr. A. Main's property at Tamahere is typical of much of the Hamilton clay loam soil of the Waikato.

THE DECLINE IN CROPPING IN WAIKATO AND WAIPA COUNTIES

Season	Cereals for threshing (acres)	Roots and green fodder (acres)	Oats for chaff (acres)	Hay and silage* (acres)
1921-22	247	16,891	2,546	17,528
1926-27	65	13,706	919	28,069
1930-31	25	5,616	459	45,236

* The area for hay and silage is shown for comparison.

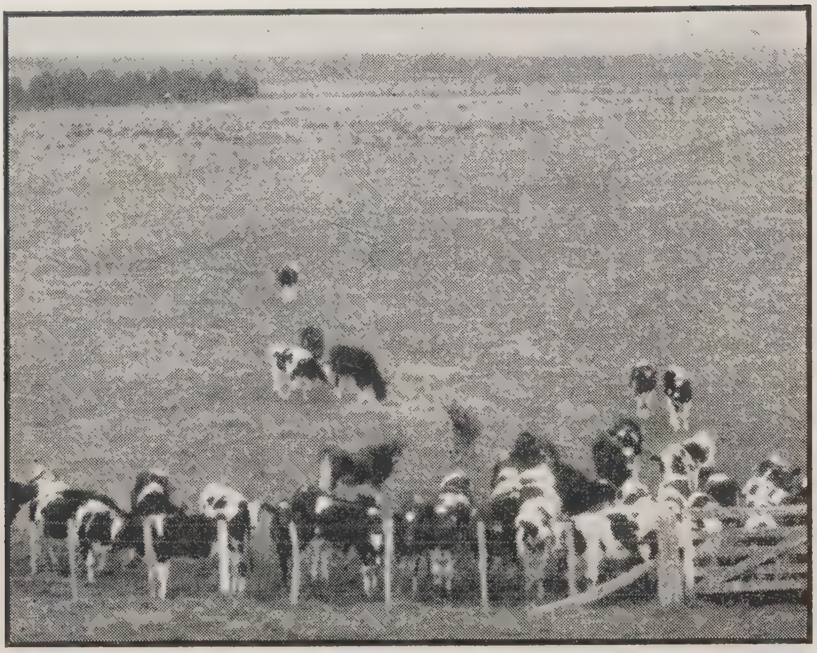
The salient feature of the modern Waikato is milk production by the conversion of pasture into cow's milk for dairy products and pig meat and into ewe's milk for fat lambs. The true conception of milk production is said to have been introduced about 1900 by new arrivals from Taranaki who settled on the estates, bringing with them not only the dairy breeds of cattle, but also their hard-won experience in co-operative dairy-factory organisation. On their arrival they found that Waikato dairying was a sideline to wheat and meat production, the cows being "dual-purpose" Shorthorns, whose surplus calves could be fattened on wheat straw and swedes, or sold to pioneers on bush-burn country in the Raglan hills. The Taranaki conception of milk production, aided by climate and circumstances, eventually prevailed in the Waikato, but of course it developed local peculiarities, the chief of which were the emphasis on butter rather than cheese, the raising of pigs on skimmed milk, the use of breeding ewes as "followers-on", and the big rise in fat-lamb production

Some important happenings and their dates are the opening of the Horotiu meat works in 1916, the dairy-company amalgamation in 1920, the pioneering of group herd testing in 1922, the resurgence of sheep numbers in 1923, the formation of bobby-calf and pig marketing associations in 1927, and the foundation of pig-recording clubs in 1930. All these events were notable landmarks in the progress of animal husbandry in the Waikato, a progress which was due not nearly as much to the extension of the area of grassland as to the improvement in its carrying capacity. Whereas the average carrying capacity of Waikato grassland (expressed as "sheep units" in which 1 cattle beast equals 5 sheep) had been about $1\frac{1}{2}$ sheep to the acre in 1900, it rose to 2.1 in 1920 and to 4.2 in 1945. This improvement in the quality of pasture and its exploitation by increased numbers of cows and ewes are illustrated by statistics in the table below.

NUMBERS OF MILK ANIMALS IN WAIKATO AND WAIPA COUNTIES

	Area farmed (acres)	Cows in milk	Breeding ewes
1920 ..	321,000	51,000	36,000
1925 ..	371,000	81,000	55,000
1930 ..	350,000	106,000	127,000
1935 ..	406,000	144,000	158,000
1940 ..	414,000	147,000	255,000
1945 ..	404,000	145,000	356,000

Evidently the improvement was not due altogether to topdressing, which was fairly widespread by 1920. It is known now that it was due as much to the farming system known as "intensive grassland management" or "controlled rotational grazing," by which the pasture could be fed off, cut for hay and silage, or conserved for winter grazing, at its most nutritious



Friesian heifers on some of the 80 acres of peat that go to make up Mr. K. Rennie's 606-acre property at Netherby. Undeveloped peat land can be seen in the background.

stage of growth. Phosphatic topdressing, while it abolished the factor which limited plant growth, was actually an obstacle to pasture management, which is dependent on paddocks being small enough to be eaten down rapidly by the farm herd; and as long as milk production was the aim, small paddocks were useless without supplies of drinking water. Water was therefore the limiting factor in intensive grassland management, and, after topdressing, the most helpful innovation in the Waikato was the motor-powered water pump. Electrical reticulation of Waikato farms (made justifiable by its use for the milking-machine motor), by its adaptation for water pumping, soon made obsolete not only the old windmill, but also the big paddock in which the windmill stood.

When a limiting factor is removed energy is liberated and expansion takes place until a new equilibrium is restored. This is what happened to the dairy industry in the Waikato between 1920 and 1935. There were extraordinary social repercussions, which are not within the scope of this article, but which have been documented in the New Zealand Co-op. Dairy Company's magazine, "The Dairyfarmer", published between September, 1920, and February, 1932. Careful record was also made in the publication of the successive discoveries which together added up to the new system of grass farming. Roughly in chronological order of discovery there were:—

Haymaking with the gate sweep, swathe turner, and hoist;

Rotation of the "night paddock";

Scattering of dung;

Grass harrowing, "root pruning", and "aeration";

Mowing or "topping" of pasture;

Rotational grazing;

The nutritive value of young grass;

Subdivision into paddocks of an acreage equal to x/15, where x is the size of the herd;

The motor-car grass sweep for stack and pit silage making;

Autumn topdressing and winter calving;

Nitrogen topdressing.

Though few farmers adopted all of these discoveries, all farmers adopted some of them, and production was increased greatly. Most of the farms were too big for one family to manage on a really intensive scale (the most common size of a dairy farm in the Waikato in 1932 was 100 to 109 acres); 30 or 40 acres was said to be the optimum size. This difficulty could have been got over by employing labour. A greater problem had to do with the health of the stock, among which peculiar "grassland diseases"—bloat, milk fever, grass staggers, and facial eczema—appeared. Though remedies were found for them, they distracted attention from pasture management, which inevitably became standardised at a pitch somewhat below that claimed for it by its expounders. Topdressing remained the basis of Waikato grass farming, but recent results of work at the Department of Agriculture Animal Research Station, Ruakura, indicate that the lively history of grass farming has not yet culminated.

Locality of Farms

The three dairy farms and one fat-lamb farm that are to be studied for their topdressing practices and production over the years are situated in the Waikato basin, which includes wholly or in part the Counties of Waikato, Waipa, Piako, and Matamata. The eastern half of the basin is drained by the Waihou and Piako Rivers, and the western half by the Waikato and Waipa Rivers.

The rivers run through sandy and loam pumice terraces and plains formed from material washed down after the last great volcanic eruption in the Taupo district. Away from the river margins the plains tend to subside into vast peat bogs, occupying between 40,000 and 50,000 acres, or to rise into clay and loam downs and hills mainly formed from volcanic ash showers. Except for patches of kahikatea bush the region was devoid of forest, but many of the bogs contained the remains of large trees destroyed ages ago by fire or by a rise in the water-table. The pumice plains were covered with manuka and scrubby bracken, and the clay hills with a mixture of bracken, tutu, koromiko, and small manuka. On the brown clay of the "delta" luxuriant bracken had built up a thin layer of black humus, but there was none of the accumulated bush and tussock fertility which gave farming a good start in other regions.

Climate

With a well-distributed annual rainfall of about 50in. and a mean temperature of about 56 degrees F. the climate is ideally suited for pasture growth and this to a large extent compensates for any deficiencies in the natural soil fertility. The comparatively mild winter permits a long period of ryegrass and clover growth. The wettest period is from May to July inclusive, after which the rainfall declines, but increases to some extent in October. The dry season is from December to March. The prevailing winds are south-westerly and may be very cold at times, with occasional strong winds from the north-west. There is a possibility of frosts in almost any month, although they are very rare from October to April.

A Cambridge Fat-lamb Farm

A Cambridge fat-lamb farm is to be considered in this section. The late Mr. Alfred Main purchased in 1886 the property of 482 acres on the Hamilton-Cambridge main highway, 7 miles from Hamilton. The area consisted of about 380 acres of very poor pasture on rolling country, 60 acres of very wet land around the foot of the rolling country and covered with heavy manuka, and 40 acres of river terraces in fern and manuka. The property is now farmed by the late Mr. Main's two sons.

The 482 acres, which were subdivided into seven fields of 60 to 80 acres, apart from a few small paddocks round the homestead, were watered by two windmills and the river. Hawthorn hedges separated one field from another and two shelter belts of pines had been planted on two of the boundaries and one through the back of the property. The English system of farming prevailed and the settlers carried out

Lawsonianas doing well on peat land and providing valuable shelter. The shelter belts run north and south to avoid undue shading of the pasture.

mixed farming. One modification of the English system was that fertilisers such as rock phosphate, guano, superphosphate, and bonedust were used instead of farmyard manure. Lime was also available as far back as 1876.

History of Development

Mixed farming was continued for a number of years and it was the practice to sow one of the fields of 60 to 80 acres each year in wheat at the rate of 2 bushels per acre with 2½cwt. of bonedust and superphosphate in the proportion of 2 parts of bonedust to 1 part of superphosphate. In 1889 a field of about 70 acres was sown in wheat, which when harvested was shipped to Sydney. The yield about this time was between 30 and 36 bushels per acre, varying according to the season. Swedes were also grown for sheep and oats for the horses. In 1889 a field was sown in swedes at a seeding rate of ½lb. per acre and sown with 2½cwt. of bonedust and superphosphate per acre. Algerian was the type of oats grown and 2½ bushels per acre were sown with 1cwt. of fertiliser per acre. In those days the farmer mixed his own manures, especially the swede manures, because the custom was to mix the seed with the manure and sow the mixture through one box. This did away with the watching of the seed when sowing, and better results were claimed. The fertilisers gave the swedes a good start, so that good crops were secured. In those days bonedust was very coarse compared with that used today and the farmer felt that when the crop had been taken off there was still some manure left if bonedust was used, and this would help the young grass that followed the crop. In October, 1889, 394 ewes were on the property as well as horses for farm work. In 1892 work was started on the development of the 60 acres of swampland, which was cleared of manuka and drained, using manuka drains. Some of these drains are still working today after being down for over 50 years. Later, and over the years, tile drains have been laid to replace the old manuka drains.

STOCK-CARRYING CAPACITY ON MR. A. MAIN'S PROPERTY OF 482 ACRES

Season	Area in grass (acres)	Area in crops (acres)	Area in hay and silage (acres)	Fertiliser and lime (cwt. per acre) Fertiliser	Lime	Stock carried Breeding ewes	Dry sheep	Cattle
1886	320	60	—	3*	—	323	391	97
1890	320	74	—	3*	—	238	697	110
1900	410	60	—	3*	—	280	533	116
1910	420	60	—	3*	—	282	331	159
1920	482	—	6	2½	—	—	250	244
1925	482	—	12	2½	—	—	200	380
1930	482	—	12	2½	—	576	232	370
1935	482	—	12	5	2	850	225	263
1940	482	—	12	4	2	1,775	—	166
1942	482	—	16	4	2	1,945	—	200
1944	482	—	20	2	2	1,892	—	173
1946	482	—	—	2	2	1,900	48	160
1947	482	—	—	2	2	1,900	60	180

* Cropping area only.

NOTE: Before 1912 fertiliser was used for cropping only and bonedust, blood and bone, and superphosphate were sown with the seed at the rate of 3cwt. per acre. In 1920, 1925, and 1930 A.F.F.C.O. A1 fertiliser was used while in 1935 superphosphate, Seychelles, and blood and bone were applied together with Clark's No. 1 potash mixture. Superphosphate, blood and bone, and Clark's No. 1 potash mixture were applied in 1940 and 1942, but owing to fertiliser rationing the phosphate applied was reduced and in 1944, 1946, and 1947 cobaltised serpentine superphosphate was applied together with 30lb. of muriate of potash.

Further subdivision was not carried out until about 1920, some 8 years after topdressing began, and today the farm is in 20-acre paddocks with smaller holding paddocks near the homestead. The introduction of electricity had its effect on subdivision, since it made possible the laying on of water to all paddocks, the old windmills not proving very successful.

Of recent years lawsonianas and gums have been planted for shelter, but hedges have not been put in. Some of the old hawthorn hedges and rows of pines planted over 70 years ago still remain. One old pine which was milled in July cut over 7000ft. of timber.

The grass-seed mixture used since 1910 consisted of cocksfoot 8lb., Poverty Bay ryegrass 10lb., Italian ryegrass 6lb., timothy 4lb., meadow foxtail 1lb., red clover 2½lb., cowgrass 2½lb., white clover 2lb., and rape ½lb., making a mixture of 36½lb. per acre. This was sown with 2cwt. of a mixture of 2 parts of bonedust and 1 part of superphosphate per acre.

The pasture sward in 1906, just before topdressing started, consisted predominantly of sweet vernal and cocksfoot with little or no clovers.

For the period of the table on this page no sheep were bought in for fattening. From 1886 to 1910 wheat and oats were grown and manure was

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used for laying down crops and young grass only. Cropping ceased in 1917. From 1942 to 1947 only 60 per cent. of the farm was topdressed.

Topdressing

Before 1910 little was known about the benefits of topdressing pasture sward, but about 1910 it was realised that topdressing as a grassland management practice would enable high-class pastures to be produced on poor land. It was found that the effect of topdressing was to provide a veneer of fertility which provided food for the shallow roots of the white clover plants and grasses and thus made the clover perennial on poor soils. With the advent of refrigeration and the establishment of the Southdown freezing works and later the works at Horotiu organic manures began to be used for topdressing.

With the introduction of topdressing ploughing ceased, as the pastures that previously had to be ploughed up and renewed every 4 years could be held and improved with the use of artificial manures. The last field was sown down in 1917 and since then no plough has been used on the property. Heavy stocking was made possible by autumn topdressing, which provided a flush of feed for the winter.

In 1916 the manures used for topdressing were equal parts of bonedust, superphosphate, and guano at the rate of 2½cwt. per acre, mixing of the manures being done on the farm. It must be remembered that at that time the appliances available for topdressing were very limited. At first the sowing was done by hand from a bag around the neck of the sower, and a little later the grain drill was used after the coulters had been taken off. Little lime was and has been used, because early trials did not give any noticeable result from heavy applications. As it has been confirmed of recent years that heavy dressings of lime gave little or no response and because the high cost of haulage and wages for distribution of a cheap fertiliser such as lime are the same as for a dearer one such as phosphate, an annual application of only 2cwt. of lime per acre is made.

For a number of years before the Second World War 30lb. of 30 per cent. potash salts per acre were used as well as the annual dressings of phosphatic fertilisers. The potash was applied together with superphosphate and Seychelles guano in the form of Clark's No. 1 potash mixture. The 2cwt. of lime and 3cwt. of phosphate (including Clark's No. 1 potash mixture containing 30lb. of 30 per cent. potash salts and 70 per cent. of phosphate) were mixed together and sown through the distributor in one application.

Sixty per cent. of the farm is topdressed each year, part being done in the autumn to give late-winter and early-spring feed and the remainder in November and December to give an autumn flush to carry the stock through the winter. The pasture sward is now a high-producing one consisting predominantly of perennial ryegrass and white clover.

Part of the lucerne stand on Mr. G. Hall's farm at Hairini. This field was first put in lucerne 10 years ago and was resown 2 years ago after a deep ploughing. A stack of silage and 3 stacks of hay are made each year off this 6-acre field.

Utilisation

About 8 years after topdressing was started subdivision was begun so that the great bulk of feed resulting from the application of artificial manures could be utilised to the full. Rotational grazing was and still is practised. With the great bulk of feed produced from the topdressed pastures becoming available, cropping was discontinued and a field of about 20 acres made into hay each year for feeding to the cattle in winter. With both autumn and spring topdressing it is possible by management to have grass available almost throughout the year and therefore little hay is necessary.

Production

In 1889, besides the 70 acres in wheat, 394 ewes were carried on the swedes and temporary pasture. The carrying capacity in 1892 was 200 ewes, 655 hoggets, wethers, and rams, 10 head of cattle, and 14 horses. The ewe fleeces averaged 11lb. per head when shorn. By 1896, 737 ewes were run and in 1900 the figure was only 236 ewes, and in 1906 the total number of sheep shorn was only 427. These were Leicester and Lincoln breeds.

Cropping of all kinds ceased in 1917, by which time the whole area was in pasture, in which it has remained since.

A gradual improvement in pasture production and therefore in carrying capacity has resulted over the years and today the carrying capacity is 1900 ewes and 172 cattle. All lambs are sold fat off the property and ewe replacements brought in each year.

This is a considerable improvement over conditions that prevailed 30 years ago, and has been brought about largely by topdressing with artificial manures, which has done away with the very costly and laborious system of cropping and pasture renewal.

An Orini Dairy Farm

The Orini dairy farm to be discussed was acquired by the late Mr. George Rennie in 1916. A property of 606 acres, it is situated on the main Taupiri-Orini road 6 miles from Taupiri. The area consisted of 400 acres of flat and rolling country carrying a very poor pasture of paspalum, Yorkshire fog, browntop, and sweet vernal, and 206 acres of peat swamp which was in standing scrub. No subdivision had been done and there was no shelter on the property.

History of Development

Twenty to 30 acres of the poor Yorkshire fog and browntop pasture was ploughed up each year and sown in swedes followed by soft turnips in spring and then into grass the following March. Superphosphate was drilled in with both swedes and turnips and was sown with the new grass at the rate of 3cwt. per acre. Ten tons of lime was also applied. Very good crops of swedes and turnips were grown on this virgin soil and they were free from disease. The practice was continued year by year until 1932, by which time the 400 acres had been regrassed.

The seed mixture used on this flat and rolling country was Hawkes Bay perennial ryegrass 20lb., Akaroa cocksfoot 10lb., white clover 2lb., timothy 2lb., crested dogstail 2lb., red clover 3lb., and alsike 1lb.

All efforts were concentrated on bringing into full production the better land and development of the peat area was not begun until 1929. From then on the peat area was gradually brought in by cutting the heavy manuka, burning, and swamp harrowing until the area was reasonably level and a cheap grass-seed mixture was sown. The mixture consisted of cocksfoot, which was cut from the roadsides near the farm, and a little Canterbury ryegrass and paspalum at the rate of 30lb. per acre. The farm has been well subdivided to give a stocking rate of 10 cows per acre while the paddock is being grazed. There are about 2 miles of lawsoniana and *Cupressus benthami* trees in shelter belts as well as over a mile of barberry hedges. Water is laid on to all paddocks and is supplied by 5 bores. Open drains were dug where necessary through the 206 acres of peat swamp.

Topdressing

Topdressing of pasture was practised as far back as 1919, when the first development work was begun. The areas that had been regrassed after cropping were topdressed each year with 3cwt. of superphosphate per acre and 5cwt. of lime; no topdressing was carried out on the areas in poor pasture. The area that had been sown in new grass in autumn was given an additional 3cwt. of superphosphate per acre in the following spring to give it a good start. In 1924 Belgian slag was applied to a large area of the farm at the rate of 4cwt. per acre. The slag at that time was most beneficial to the heavy flat land, and the pastures responded well and were very palatable. The use of Belgian slag was continued until 1939, when it became unprocurable. When fertiliser rationing was introduced the topdressing programme had to be cut down considerably. However, with the past heavy dressings the production held very well for about 3 years, with the reduced application of 1½cwt. of phosphate per acre, and then a noticeable drop occurred which is gradually being overcome as more fertiliser is becoming available. Copperised superphosphate is used on the peat areas. Topdressing was first carried out with the grain drill and now a spreader-type topdresser is used.

Some of the pastures have been down for over 25 years and are now carrying a first-class sward of perennial ryegrass, cocksfoot, and white clover. Because of the greatly increased pasture production through autumn topdressing, heavy stocking has been made possible, and by conserving surplus grass as hay, cropping has not been necessary and has not been carried out since 1932. Topdressing, in conjunction with careful stocking and good pasture management, has made possible the establishment and maintenance of a good ryegrass-white clover sward on poor soil.

Utilisation

Rotational grazing is practised in spring, the cows being allowed free range after January. About 12 acres of spring growth is made into silage each year and fed to the cows in January or February when drought conditions have halted pasture growth. Between 60 and 70 acres of hay are also made each season. A surplus of a year's requirement of hay is carried over each year as an insurance against a poor spring when little pasture growth is available for shutting up for hay. Cropping has not been practised since 1932, with the exception of a small area grown under the system of peat development and to assist in more rapid consolidation. By feeding out on the peat swamp in winter the consolidation so necessary for peat development was hastened. Also, because of this, the good land could be rested in winter, thus preventing pugging and giving a much earlier spring growth, free from buttercup, which so quickly establishes under puggy conditions.

About half of the 400 acres of good land is shut up each autumn to provide good, succulent grass feed for the milking herds in late winter and early spring before pasture growth has got under way about mid-September.

Modern machinery has made haymaking and silage making a much less laborious task and surplus spring pasture growth can now be conserved, thus fully utilising the extra production brought about by topdressing. By conserving this extra spring growth not only is waste prevented but damage to the pasture sward is also avoided.

Production

In 1916 there were 250 acres in grass. Dairying was begun in 1919, when 58 Friesian cows which produced 9873lb. of butterfat were carried; 300 breeding ewes and 60 yearlings were also carried. The herd was not increased until 1924, from which date a gradual increase in the size of the herd was made. By 1930 the area under grass had been increased to 500 acres and has since remained at that acreage. A total of 161 cows was then run as well as 70 heifers and 60 hoggets; the butterfat production was 49,321lb. Another shed was started in 1934 and a further herd of 70 heifers was milked. The production in 1935 was 80,155lb. of butterfat from 239 cows, and by 1940 it had reached the peak of 86,862½lb. of butterfat from 255 cows. In 1940, 160 heifers and 100 hoggets were also carried.

Although the herd was increased to 267 in 1942, the production had fallen to 77,485½lb. and by 1945 production was down to 55,146lb. of butterfat. This fall was due in a great part to the lack of fertiliser during the war. Less than half the pre-war allocation of 3 1/3cwt. per acre was available and although the drop in production was only slight for the first 2 years of the war, no doubt because of the built-up reserve of fertility from previous heavy topdressing, it was greatly accelerated in the latter years of the war by which time the fertility had been greatly depleted. With the increased fertiliser allocation in 1946 and 1947 the production has risen slightly.

It can be seen from the figures contained in this brief summary of the development of Mr. Rennie's property that artificial manures have increased production tremendously and that when insufficient fertiliser is applied in any one or more seasons there is a very noticeable drop in production.

Te Awamutu Dairy Farm

The history of the Te Awamutu dairy farm to be considered began when the 640-acre property known as the Thornecombe estate, which was taken over by Major Jackson as an officer's grant after the Maori Wars, was sold to Mr. A. V. McDonald and in 1914 was subdivided into 3 blocks, Mr. G. Hall purchasing the Hairini section of 147 acres.

The farm is on the main Te Awamutu-Cambridge road, 2 miles from Te Awamutu. Before Mr. Hall took over the property a number of crops of wheat were taken off it and sheep run on the temporary pastures, which would stay down for 3 to 4 years, by which time they had run out and would be reploughed and cropped. When the property was purchased the pastures were completely run out. Because of continual cropping, the pastures were almost entirely twitch with some Yorkshire fog and sweet vernal. There was a complete absence of clovers. The 147 acres were subdivided into 4 paddocks without a hedge or tree being planted and with a little manuka still remaining in a hollow.

There was no water supply laid on to the paddocks, the sole water available to stock being from a poor running stream on the back boundary of the property. The country was sheep sick and overrun with rabbits and infested with rabbit warrens. The settlers nearby would not eat rabbits off the property because they did so poorly.

History of Development

The first stage in the development was to gas the rabbits, and little more was done until 1920 when Mr. Hall sold the adjoining property and came to live on the farm. For the next 10

PRODUCTION ON MR. K. RENNIE'S FARM OF 606 ACRES

Season	Area in grass (acres)	Area in crops (acres)	Area in hay and silage (acres)	Fertiliser and lime per acre (cwt. per acre) Phosphate	Potash	Lime	Dry stock carried Sheep	Herd replacements	No. of cows milked	Butterfat (lb.)
1916	250	—	—	—	—	—	—	70	—	—
1920	275	25	10	1½	—	1	300	60	58	9,873
1925	400	42	49	3	—	1½	150	75	130	31,728
1930	500	22	66	3	Total of 6 tons	1½	60	70	161	49,321
1935	500	18	73	3⅓	—	2	100	140	239	80,155
1940	500	10	80	1½	—	2	100	160	255	86,862½
1941	500	7	83	1½	—	3	50	135	243	77,485½
1942	500	9	68	1½	—	1½	55	141	267	71,871
1943	500	5	71	1½	—	2	30	132	200	60,010
1944	500	—	66	1½	Total of 1 ton	2	50	120	199	65,463
1945	500	—	55	1½	Total of 2 tons	2	75	133	205	55,146
1946	500	20	69	2	—	2	58	147	201	59,927
1947	500			2			60	132	223	

The rich flats on Mr. S. Roberts's farm at Rukuhia, with picturesque clumps of kahikatea dotted about. The Kaipaki district can be seen in the background.

years a considerable amount of breaking up with the plough was done and the areas cropped with turnips followed by rape and sometimes millet and then into grass. The policy was to break up 20 acres of the run-out pasture each year.

The turnips did wonderfully well on the virgin soil. There seemed to be something in the Waikato soil that suited turnips, but once it was exhausted it never returned and as the land improved in fertility disease and blight of every description occurred. A proprietary manure consisting mainly of blood and bone was sown with the turnips, rape, and grass at the rate of 3cwt. per acre. Carbonate of lime was also sown at the rate of 6cwt. per acre. The grass-seed mixture used on all occasions was perennial ryegrass 10lb., Italian ryegrass 10lb., white clover 2lb., red clover 4lb., cocksfoot 8lb., timothy 1lb., crested dogstail 3lb., and meadow foxtail 2lb., making a seed mixture of 40lb. in all.

In 1918 four settlers had the water laid on from the Te Awamutu town supply at a cost of £500. This source of supply still remains, but it was necessary to supplement it in the dry months, so 2 bores were drilled. Water is now laid on to all the paddocks, and concrete troughs are used throughout.

The property was gradually subdivided into small paddocks averaging about 6 acres each, and lawsoniana shelter belts were planted as well as barberry hedges. Lawsoniana does well on this land, and Mr. Hall has planted over half a mile of shelter belts of these trees. The young trees are double fenced to a width of 12ft., and when the trees have been in a few years the distance between fences is increased to 21ft. Thus it is ensured that a good undercover is retained. Barberry, which forms the remainder of the hedge shelter on the farm, also does well and there is now over a mile of barberry hedges.

Until 1922 the property was used for dry stock. A small herd of 25 Milking Shorthorns was then established and this herd has been gradually increased over the years. At present a number of steers are carried as well as the dairy herd. No replacements have been purchased for over 10 years, all stock being reared on the farm.

Topdressing

Topdressing of pastures was not practised until 1925, mainly because little or nothing was known about its benefits and also because the quantities available were only sufficient for sowing down with crops and young grass. Because of lack of topdressing before this, the pastures would require renewing at least every 4 years. This practice of renewing pastures was continued until about 1925, by which time the farm had been reploughed on two occasions and regrassed. Since topdressing of pastures was commenced in 1920 the practice has been to apply 3cwt. of superphosphate and 6cwt. of carbonate of lime per acre per annum. About 1925, because of the scarcity of superphosphate, basic slag was used for 4 or 5 years at the rate of 3cwt. per acre per annum, but it was replaced by superphosphate as soon as it became available in sufficient quantities. With the outbreak of the Second World War serpentine superphosphate was applied at the rationing quota of approximately 2cwt. per acre and this type of phosphatic fertiliser has been used ever since in place of superphosphate. The application of 6cwt. of lime per acre per annum was continued throughout the war. In the early days the appliances available for topdressing compared with those used now were primitive. The most accurate was the grain and turnip drill, 11 boxes wide, and set high up. The alternative to this method was to sow by hand from a bag around the neck. Today topdressing is done with a distributor drawn by horses.

PRODUCTION ON MR. G. HALL'S FARM OF 147 ACRES

Season	Area in grass (acres)	Area in crops (acres)	Area in hay and silage (acres)	Fertiliser and lime used (cwt. per acre)			Dry stock carried	No. of cows milked	Butterfat (lb.)	Weather
				Phosphate	Potash	Lime				
1920	147	20	15	3	—	6		25	5,000	
1925	147	20	30	3	—	6		50	11,000	
1930	147	10	40	3	—	6		50	12,000	
1935	147	—	40	3	—	6	80	60	15,000	
1939	147	—	45	3	—	6	70	80	21,673	
1940	147	—	50	1½	—	6	55	95	26,085	
1941	147	—	50	1½	—	6	65	85	23,335	
1942	147	—	40	1½	—	6	60	90	22,356	
1943	147	—	45	1½	—	6	69	81	20,839	Severe drought year
1944	147	—	45	1½	—	6	78	72	20,552	Dry autumn
1945	147	6	40	1½	—	6	70	80	17,198	Drought year
1946	147	6	40	2	—	6	67	83	19,809	Dry autumn
1947	147	6	40	2	—	6	76	74	18,945	Dry autumn

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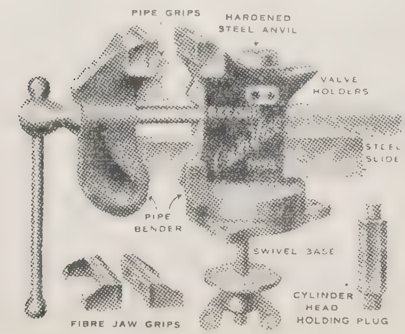

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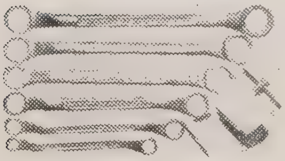

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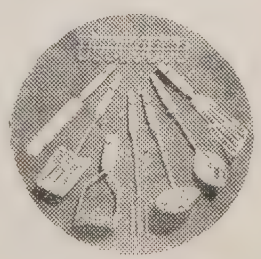

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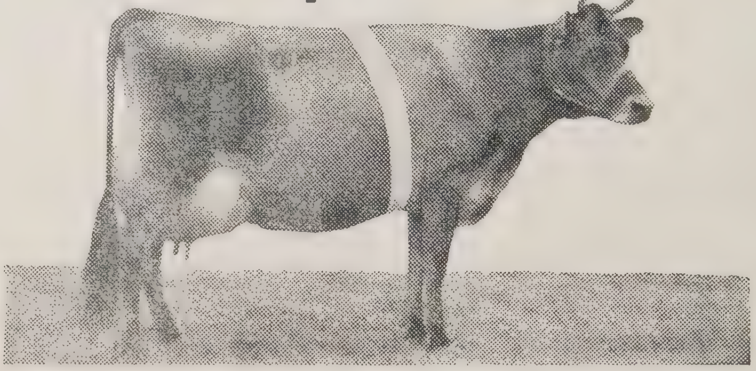

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A close-up study of pasture on semi-developed peat, showing sorrel and bare ground. The grasses and clovers sown after the scrub had been cleared have all died.

With the introduction of topdressing ploughing ceased, as the pastures that previously had to be ploughed up after 4 years because they were run out could be held and improved with the use of artificial manures. The 30 paddocks of the farm have been down for 20 years and are now carrying a first-class sward of perennial ryegrass, white clover, cocksfoot, and timothy. With the greatly improved life and production of the sward through topdressing, little cropping has been carried out for a number of years. The competition from weeds and the cost of regrassing after cropping are so great that any satisfactory way of overcoming the cropping problem is welcome. With modern machinery hay and silage can be made to replace turnips and swedes and the fields are shut up for only 8 weeks, whereas with a crop they are lost to grazing for a much longer period.

The farm is topdressed in autumn each year with the exception of the lucerne paddock, which is topdressed after the first cut in spring; the hay paddocks also receive an extra dressing in spring.

Utilisation

Rotational grazing is practised on the farm, which is well subdivided for the purpose. Pastures are topped where and when considered necessary to control the grass when it tends to get away. All surplus pasture is made into hay and silage, from 35 to 45 acres being shut up each season.

In addition to this an area of lucerne has always been grown, the first cut being made into silage, the next two into hay, and if there is a scarcity of feed in a dry summer, the remaining lucerne is cut and fed daily to the milking cows.

In autumn about a third of the farm is shut up and this autumn-saved pasture is fed to the cows after they have calved in early spring and before spring pasture growth has started. This critical feed period of late July, August, and sometimes well into September has been overcome almost completely by autumn topdressing of pastures and then shutting them up and conserving much of the flush autumn growth for feeding out. Mr. Hall realises that the greatly increased growth brought about by topdressing with artificial manures must be fully utilised if the most is to be got out of the increased pasturage, and therefore very careful thought must be given to pasture management.

Production

In 1922, the year in which a change was made to dairying, the butterfat production was about 5000lb. By 1932, 10 years later, the dairy herd had been increased from 25 to 60 cows and butterfat production to 15,000lb. There was a gradual increase in dairy stock carried and in butterfat produced each year up to 1940 when 95 cows were milked producing 26,085lb. of butterfat. Besides the 95 head of dairy stock, 55 head of dry stock were run, including 25 steers as well as heifers. During the war fewer dairy cows were carried and the number of dry stock was increased. For the past 10 years the property has carried a beast to the acre throughout the year. Throughout this 25-year period the area in grass has remained the same, the area in crop has been reduced from 20 acres to no cropping, and, because of topdressing and with it a very substantial increase in pasture production, necessitating subdivision and good pasture management, the carrying capacity has been increased enormously and butterfat production has ranged from 5000lb. to 26,085lb.

A Rukuhia Dairy Farm

The Rukuhia dairy farm to be discussed is a property of 150 acres situated on the main highway between Hamilton and Te Awamutu and 6 miles from Hamilton. It was purchased by Mr. W. R. Roberts in 1910 and is now farmed by one of his sons, Mr. S. Roberts. The farm had previously been used by a contractor for grazing horses and was carrying a pasture predominantly of ratstail and twitch with a complete absence of clovers on the rolling country, while the flats were in kahikatea swamp and covered with blackberry and stumps. The farm was then in 3 paddocks without shelter of any kind.

History of Development

A system of ploughing up each year 12 to 15 acres of this very poor ratstail pasture was followed and the area was put into Algerian oats for chaff and the following year into grass. Bonedust was used at the rate of 3cwt. per acre when sowing both oats and new grass. The manure was mixed with the oats and sown with the grain drill. The oats were cut in January and the land prepared and sown in grass in March.

The seed mixture used per acre was Hawkes Bay ryegrass 25lb., Akaroa cocksfoot 4lb., Italian ryegrass 5lb., crested dogstail 1lb., white clover 1½lb., cowgrass 2½lb., and subterranean clover 1lb. After sowing down the pasture was not topdressed and in most cases was ploughed up after 4 or 5 years and regrassed.

Development of the swamp began in 1914 with the breaking in of 4 acres and this practice was continued each year. The area was first stumped by hand, then burnt, and sown with millet or soft turnips as a catch crop, and then to grass. Open drains were put in where required. The swamp-land was sown in spring, while the rolling country was autumn sown. It was found that if the swamp-land was autumn sown the clover plants would be badly frosted. The grass-seed mixture per acre used was H.B. ryegrass 20lb., Italian ryegrass 8lb., cocksfoot 4lb., white clover 2lb., cowgrass 4lb., and timothy 2lb.

The farm has been well subdivided into 8-acre paddocks, and lawsonianas are grown for shelter on the rolling country, while barberry is used on the flats. There is about 1 mile of lawsonianas and 1 mile of barberry hedges.

Water is laid on to all paddocks and is supplied by 2 bores and 1 artesian well.

Topdressing

Topdressing was not practised until 1920, because little was known about its benefits and also because the limited supply of fertiliser available was required for cropping and sowing with the young grass. The original ratstail pastures did not warrant the expenditure of money on artificial manure. About this time it was realised that topdressing would enable high-class pastures to be produced on poor land by building up the fertility in the top few inches of the soil. This provided food for the grasses and clovers and the flush of feed obtained made heavy stocking possible. Of the fertiliser used bonedust was the favourite until it became scarce and expensive.

Since topdressing started in 1920 the practice has been to apply a mixture of equal parts of superphosphate and bonedust at the rate of 3cwt. per acre and lime at 5cwt. per acre. A little potash, usually about 30lb. per acre, is used in addition to the phosphate and lime on the swamp country. From 1937 until fertiliser rationing began, the mixture used was 3cwt. of superphosphate, 1cwt. of bonedust, and 2cwt. of lime per acre per year, plus ½cwt. of potash on the swamp-land. Throughout the rationing period lime and potash remained at this rate, while superphosphate was reduced to 1½cwt. and lately has been slightly increased to 2cwt. per acre. Bonedust has not been available. In the early days topdressing was done with the grain drill pulled by horses; today a topdresser pulled by a tractor covers four times as great an area in an hour.

One paddock which was sown in 1916 remained down until 1946 when it was ploughed up, cropped, and resown. Most of the paddocks on the farm carry a first-class sward of perennial ryegrass, cocksfoot, and white clover, but a few have suffered from the effects of fertiliser rationing and are being ploughed up in turn and cropped with soft turnips and then put into the better types of recently developed Certified grass and clover strains.

The effects of lack of sufficient fertiliser throughout the war can be seen in the pasture deterioration and reduced production.

The farm is topdressed in autumn of each year, the hay paddocks getting an extra dressing in spring.

Mr. Roberts considers that a saturation point can be reached in the application of artificial manures, and that to get the most from them climatic conditions must be ideal, with good utilisation of the increased pasture growth.

Utilisation

Rotational grazing is practised until January and from then on the cows are allowed free range. Topping of pastures is carried out when and where necessary. Cropping was not carried out after 1930, with the exception of a paddock of soft turnips which was sown when a run-out pasture was ploughed and before it was resown.

Cropping and resowing have been necessary in recent years through lack of fertiliser during the war and resultant loss of fertility and pasture deterioration. All surplus spring pasture growth is made into hay and silage, from 30 to 40 acres being shut up for hay and 10 acres for silage each year. A surplus of 1 year's requirements of hay and silage is always carried over as an insurance against drought and severe winters. The quality of the hay and silage made would be hard to equal in the Waikato, and the method of covering haystacks is an example that could be followed by many. As Mr. Roberts points out, a considerable sum of money is spent by some farmers each year on fertiliser to give increased pasture production and then much of the excess spring growth is wasted because little or no hay and silage is made; if harvesting is carried out, it is done so late that much of the grass's value is lost. Often when quite good hay is made at least 40 per cent. of the stored hay is lost through shoddy methods of covering the stacks.

About 60 acres of pasture are shut up each autumn and this autumn-saved pasture is fed to the cows as soon as they calve in early spring, and provides good succulent feed at a time when pasture growth is very slow.

Production

In 1910, when the area in grass was 80 acres, 30 grade Jersey cows were milked and produced 6000lb. of butterfat. In addition 40 head of dry stock were carried. By 1920 the area under grass had increased to 120 acres, the stock to 60 cows, and the production of butterfat to 15.000lb. The dry-stock position remained the same. The area under grass reached its maximum in 1930 and in this year cropping ceased. The stock had increased to 90 milking cows and 32 head of dry stock and the butterfat was up to 23.000lb. Production reached a peak 10 years later at the start of the war in 1939 when the area in pasture was the same as it was 10 years previously and no cropping was carried out. In this year 110 cows and 35 head of dry and replacement stock were carried, giving a production of 36,300lb. of butterfat. Since then, although the stocking was the same and the pasture was supplemented by 7 acres of turnips each year, production has slowly declined. The production in 1946 was down to 27,000lb. of butterfat from 110 dairy cows.

Between 1930 and 1939 on a similar area in grass the stock increased from 90 to 110 cows and butterfat production from 23,000lb. to 36,300lb. With the rationing of fertiliser the production has steadily declined and in 1944 was down as low as 25.000lb. of fat. With an increase in the fertiliser allocation the production increased to 27,000lb. of butterfat in 1946. Throughout this period the same number of replacement stock were carried, but in addition about 100 hoggets were fattened each autumn between 1942 and 1947.

PRODUCTION ON MR. S. ROBERTS'S FARM OF 150 ACRES

Season	Area in grass (acres)	Area in crop (acres)	Area in hay and silage (acres)	Fertiliser and lime (cwt. per acre)			Dry stock carried		No. of cows milked	Butterfat (lb.)	Weather
				Phosphate	Potash	Lime	Sheep	Herd replacements			
1910	80	10	10 - —	2	—	3	100	40	30	6.000	
1920	120	8	20 - —	2½	—	4	100	40	60	15,000	
1925	130	6	25 - —	3	—	4	100	30	75	18.000	
1930	140	6	25 - 10	3½	—	5	100	32	90	23,000	
1935	146	—	30 - 10	4	—	5	100	40	110	30,000	
1939	146	—	35 - 10	4	½	5	100	35	110	36.300	
1940	146	—	35 - 10	4	½	5	100	35	110	35,000	
1941	140	7	30 - —	2	½	5	100	30	110	31,000	
*1942	140	7	40 - —	2	—	3	100	35	110	24,000	Severe drought
1943	140	7	40 - —	1½	½	3	100	18	110	27,000	Dry autumn
1944	140	7	40 - —	1½	½	4	100	20	110	25,000	Very dry autumn
1945	140	8	40 - —	2	—	4	100	25	110	25,000	Dry autumn
*1946	140	8	30 - 13	2	½	—	100	25	110	27,000	

* Herd trouble,

Summary

For the first 10 to 12 years in development of the Waikato the income of farmers was derived from the sale of fat stock in Auckland. For the next 20 years the English system of farming prevailed and the settlers carried out mixed farming, using artificial manures instead of farmyard manure. It was found that pastures put down following crops did very well largely because of the delayed action of the fertilisers, particularly bonedust, that were sown with the crops, and it soon became the practice to sow down grass seed with fertiliser too.

With the advent of refrigeration and the establishment of the Southdown freezing works and later those at Horotiu, as well as the opening of butter and cheese factories, the use of fertilisers for topdressing began. A one-man dairy and fat-lamb farm was now a commercial possibility and made possible the purchase of land by farm labourers.

The first topdressing was carried out about 40 years ago and with its introduction ploughing ceased, as pastures that previously had to be ploughed up after 4 years because they were run out could be held and improved with the use of artificial manures. It was then realised that topdressing as a general farm practice would enable high-class pastures to be produced on poor land. Pastures that previously carried a sward of sweet vernal, browntop, ratstail, and Yorkshire fog, with an almost complete absence of clovers, could, by topdressing, hold a pasture of perennial ryegrass, cocksfoot, and white clover.

Of the fertilisers used bonedust was most favoured until it became scarce and expensive. It was superseded by "Waikato mixture" of equal parts of bonedust, guano, and superphosphate. By 1920 superphosphate had come into its own. Today more attention is being paid to the use of minerals such as copper sulphate and cobalt.

Mechanisation has made the task of topdressing a relatively easy one on flat and rolling country. In the early days the work was done by hand from a bag round the neck, then came the use of the grain drill, and today there are many types of mechanical topdressers that have reduced the time and labour of topdressing to a minimum.

The effect of topdressing was to provide a veneer of fertility which nourished the shallow roots of the white clover plant and thus made the plant perennial on poor soil. Heavy stocking was made possible by autumn topdressing, which provided a flush of feed for winter. Today on soil that 40 years ago carried a very poor sward of native grasses with a low carrying capacity and poor production there is a first-class sward of the best of English grasses, with a carrying capacity and production in most cases at least 300 per cent. greater than it was on a corresponding area 40 years ago. Subdivision, shelter, and improved systems of pasture management have all played a big part, but in the Waikato at least it must be agreed that the major factor in the development of farm lands has been topdressing.

Spring Examination of Hives

Seasonal Notes for the Domestic Beekeeper

WITH the start of the new beekeeping season, R. Goddard, Apiary Instructor, Department of Agriculture, Tauranga, outlines spring work in the apiary and the method of determining whether a colony requires urgent attention by an examination of hive entrances.

THE early-spring examination of hives is perhaps one of the most important tasks undertaken by the beekeeper each season. Decisions made at this time affect the progress and welfare of the colony during the critical months to follow.

When hives are first opened in spring it is not necessary to examine each frame individually; a quick glance at one or two frames taken from the centre of the brood nest is usually sufficient. Although colony condition varies greatly in all districts, the competent beekeeper is able to judge in a few moments the condition of a hive of bees and their immediate requirements.

Points to Watch

For those beekeepers who have wintered hives for the first time and who are starting a new season the following points should be watched during the course of the first spring examination.

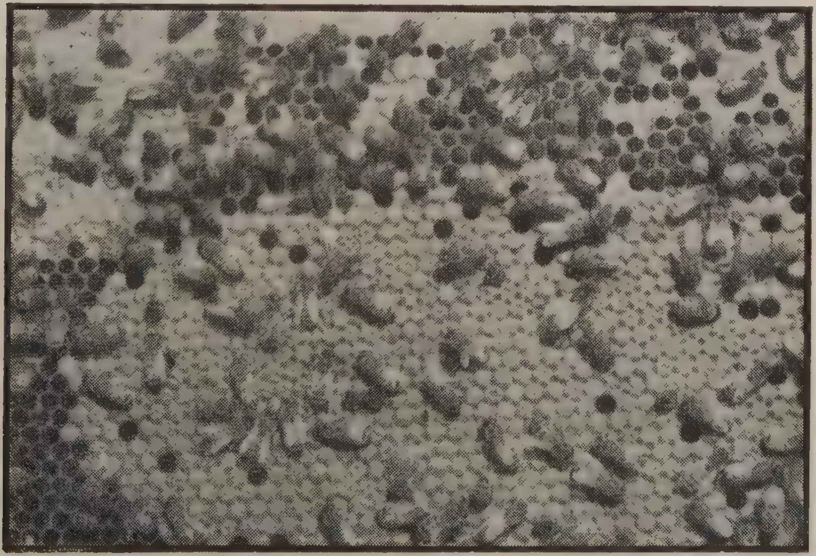
1. Has the colony wintered well?
2. Are there sufficient stores? At least 25lb. of stored honey is required.
3. Has the colony a queen?
4. Is the hive free of disease?

These reminders are of extreme importance. Domestic beekeepers too often fail to appreciate the necessity of this early-spring examination. Consequently, it is sometimes too late to remedy trouble which could have been checked if discovered in the initial examination.

In spring when hives are breeding heavily honey and pollen are consumed in large quantities by the bees and a break in the nectar flow often leaves the colony with very little stores. It has been noticed frequently that, although domestic beekeepers have wintered their hives successfully, they tend to overlook the supply of stores during spring, with the result that bees are lost through starvation. This can be attributed only to negligence on the part of the beekeeper, as a little time spent on examination of colonies would save undue loss and further expense in establishing new hives.

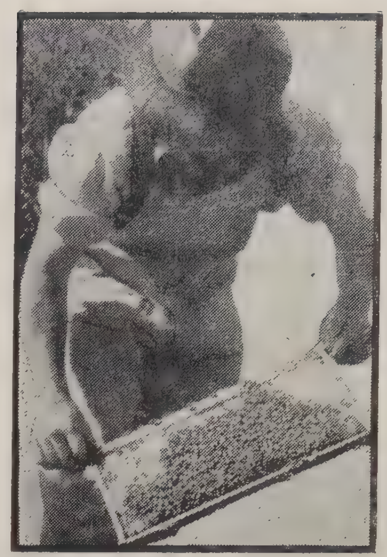
Signs at Hive Entrances

The beekeeper who studies the habits of bees and who takes an intelligent interest in their behaviour can judge the condition of a colony to some extent by an examination of the movements of bees at the hive entrance. The beekeeper who notices a few dead bees at the hive entrance in spring need not be concerned. However, large quantities of dead and decomposing bees may mean that the colony has been robbed of its stores and has died from starvation, or is suffering from some adult-bee disease. An immediate examination of the interior usually reveals the cause of the trouble.



[*National Publicity Studios photo.*

Brood in healthy condition and normal activity in the centre of the brood nest.



[*Sparrow Industrial Pictures Ltd. photo.*

Making a quick examination for brood and stores.

Robbing

Robbing may be detected by watching hive entrances closely. Fighting bees and small particles of wax cappings can be seen sometimes on the alighting board. If, on the other hand, the bees are on the verge of starvation due to lack of stores, dead larvae pulled out of the brood cells are sometimes deposited in front of the entrance. Hives in this condition would not live long unless fed immediately with combs of honey saved for the purpose from the previous season, or a mixture of equal parts of sugar and warm water placed in a feeder.

Recognition of Presence of Disease

Crawling bees, apparently unable to fly, sometimes indicate the presence of some adult-bee disease. Bees suffering from a form of paralysis, which is more prevalent in the warmer districts, generally have distended abdomens and are greasy looking. They also appear to shake and tremble and crawl from the hive in large numbers. There is no evidence of transmission of the disease to nearby colonies.

Nosema apis disease normally attacks bees in spring. Infected bees appear very sluggish and are often found at the hive entrance. However, if hives suffering from these diseases are requeened with a young, vigorous queen they usually recover and gradually regain their strength.

On warm sunny days later in spring bees are often noticed clustering at the hive entrance. This is usually a sign that the bees are short of room and the addition of a super is all that is required to start the colony working; but a quick examination of the colony inside the hive is desirable.

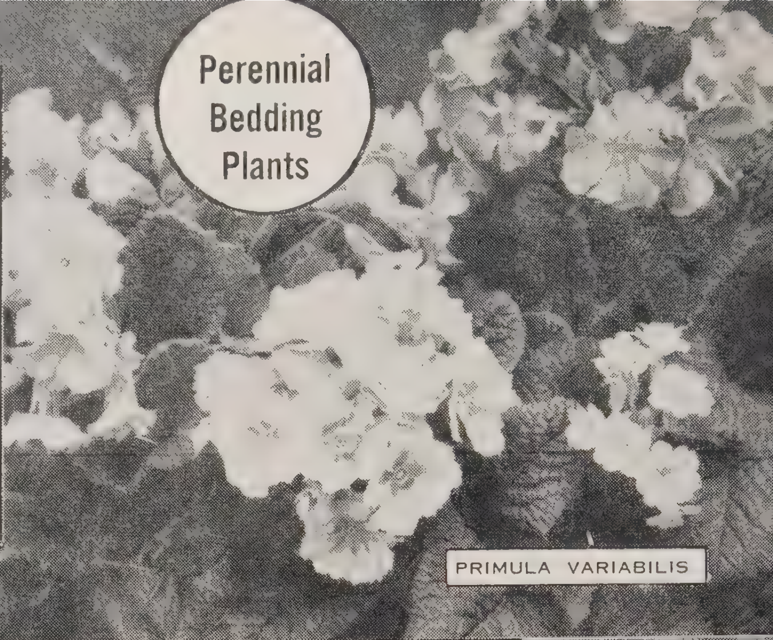
By adopting the principle of watching hive entrances closely in spring, the domestic beekeeper who has a minimum of spare time is able to pick out the colonies which are in need of urgent attention.

Perennial Bedding Plants

SEEDS of perennial bedding plants for the flower garden may be sown during November and December in pots or boxes, which are then placed in a glasshouse or frame. Artificial heat is not necessary. As some seeds—for example, those of aquilegia, phlox, primula, and mecanopsis—are often slow to germinate, the boxes should be left undisturbed for as long as 6 weeks in some cases before hopes of seeing young seedlings appear are abandoned. Seeds of most perennials can be sown in open ground if great care is taken, but by the use of boxes interference by pests, weather, and weeds is largely overcome. The seedlings are pricked off into boxes as soon as they can be handled, and later hardened off in open frames. The raising of bedding plants was described fully in an article by C. K. Ellis in the July "Journal of Agriculture".

—H. P. THOMAS, Vegetable Instructor,
Department of Agriculture, Wanganui.

Photographs by Douglas Elliott.



PRIMULA VARIABILIS

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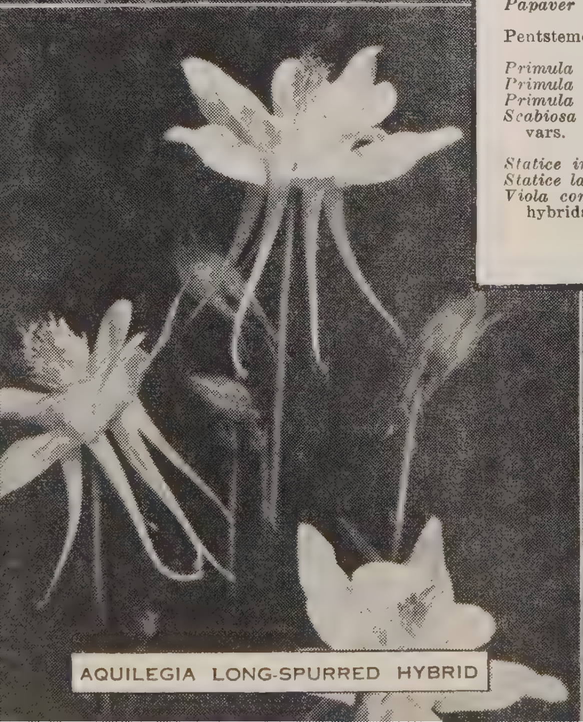
Name	Common name	Approximate height	Colour
Althaea rosea and vars.	Hollyhock	4 to 6ft.	Various
Aquilegia (long-spurred hybrid)	Columbine	2 to 3ft.	Various
Armeria maritima	Giant thrift	1½ft.	Pink
Aubrietia deltoidea and vars.	Purple rock-cress	3 to 4in.	Purple, lavender, pink
Coreopsis grandiflora	Tickseed	2 to 3ft.	Yellow, orange shades
Dahlia, Coltness hybrids		1½ to 2½ft.	Various
Delphinium hybrids	Perennial or hardy larkspur	1 to 6ft.	Various
Dianthus caryophyllus	Border carnation	1 to 2ft.	Various
Dianthus plumarius and vars.	Hardy pinks	1 to 2ft.	Various; double and single
Erigeron roushami and vars.	Fleabane	1½ to 3ft.	Lavender
Gaillardia grandiflora and vars.	Blanket flower	1½ to 2ft.	Orange, reds
Gazania species	Treasure flower	6in. to 1ft.	Various
Geum coccineum, named vars.	Strawberry flower	1½ft.	Red, yellow, orange
Lupinus polyphyllus var. Russell strain	Lupin	2 to 5ft.	Various
Mecanopsis baileyi	Himalayan blue poppy	3 to 4ft.	Azure blue
Papaver orientale	Oriental poppy	1½ to 2½ft.	Various
Pentstemon hybrids	Beard tongue	2 to 3ft.	Various
Primula auricula	Auricula	1ft.	Various
Primula variabilis	Polyanthus	1ft.	Various
Primula vulgaris	Primrose	6in. to 1ft.	Various
Scabiosa caucasica and vars.	Seabions or pincushion flower	1½ft. to 2ft.	Lavender, white
Statice incana	Sea lavender	1ft.	Pale pink
Statice latifolia	Sea lavender	2ft.	Blue
Viola cornuta and hybrids	Violas	6in.	Various

PRIMULA AURICULA



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Lawn Management is a Large Part of the Flower Gardener's Tasks

IF the average home gardener analysed his working time in his garden, he would find that a remarkably large proportion of it was spent on his lawns. Probably in most cases sufficient time is given to work on the lawns, but in many instances insufficient thought is given to them. In this month's article for the flower gardener C. K. Ellis, Horticulturist, Department of Agriculture, Dunedin, discusses the more important aspects of good and efficient lawn management.

LAWNS, like all other parts of the garden, usually benefit from regular applications of fertiliser. Such applications should be made four times each year, in spring, in midsummer, during early autumn, and in midwinter.

The fertiliser mixture most suitable for general recommendation in New Zealand consists of 3 parts of sulphate of ammonia, 1 part of superphosphate, and 1 part of sulphate of iron. This mixture should be distributed evenly at the rate of 1oz. per square yard. Readily available nitrogen in small amounts is most desirable during the growing season, for it increases the vigour of the grasses and improves their colour. Such nitrogen is supplied by the sulphate of ammonia, but the effects are only temporary, so that to obtain the maximum benefit from the fertiliser the applications must be regular.

If the mixture is applied dry, the grass should also be dry at the time or burning will result. The fertiliser should be watered in thoroughly immediately after application. Applying the fertiliser in liquid form is preferable, 1oz. of the mixture to 1 gallon of water being used for each square yard of the lawn. This method usually obviates the risk of burning the grass.

Topdressing Lawns

Several purposes are served by topdressing a lawn: Slight depressions are levelled, a light mulch is provided for the grass roots, and a certain amount of mineral plant food is supplied. Several light dressings at fairly frequent intervals give vastly better results than heavy ones applied at long intervals. The depth of topdressing material should never exceed ½in., the ideal being about ¼in., and the work should be done during either spring or autumn. The material should be spread evenly over the turf and be carefully raked into the grass or worked down into the low spots with a rake or with a board attached to a handle.

Soil passed through a ½in. sieve is most suitable as topdressing material. Dressings of pure materials such as clay or sand are most undesirable, for they bring about a layered condition which interferes with the movement of water in the soil.

[Sparrow Industrial Pictures Ltd. photo.

A good lawn greatly enhances the appearance of the garden and home. A person using a mower should walk erect so that no additional weight is placed on the mower wheels to cause furrows in the lawn when the turf is wet and soft.

Lawn-mowing Technique

A lawn is mown chiefly to improve its appearance; mowing is not, as many people believe, beneficial to the grasses. The bulk of the food of grass plants is produced in the leaves by the action of sunlight in a process known as photosynthesis. Therefore the more leaf a plant has the more food is available for growth, the greater will be the root system, and the stronger will be the plant. The strength and extent of root growth are proportional to top growth.

A blunt mower bruises and crushes the tops of grass blades instead of cutting them cleanly and is usually responsible for the brownish colour of a lawn a few days after it has been mown. The mower must be sharp so that the grass blades are cut cleanly without bruising or crushing and no pull is exerted on the roots of the plants.

It pays to buy a good mower and to keep it in good condition by cleaning it regularly and oiling it frequently with high-grade light machine oil.

Newly established lawns should be mown when the grass is 1½ to 2½in. high. Established lawns should seldom be cut much lower than 1in. from the soil; quite often lawns are damaged severely through being cut too closely. On large areas of lawn which are reasonably weed free grass 1½in. long does not impair their attractiveness.

More than about an inch of grass should never be cut off with the mower at one time. In the warmer districts that probably means mowing every few days. If grass is allowed to grow long before being cut, the lower parts that are left will be bleached and rather ugly and many weeks may pass before such grass recovers and regains its healthy green appearance. On the other hand, continuous close cutting may produce such symptoms as thinning of the turf, lack of resistance to drought, and invasion by weeds. Close cutting also inhibits the healthy development of the root system, necessitating more frequent applications of fertilisers and greater attention to watering.

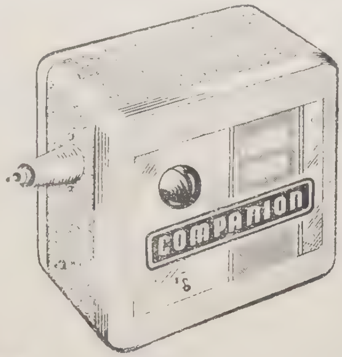
Shaded places in a lawn where grass growth is weak should not be mown as frequently as other areas. Light mowing only a few times a season should suffice, normal mowing being likely to kill the grasses in such situations.

Lawn Clippings may be Left

The clippings from the first mowing of a newly seeded lawn should be left on the ground. They form a good mulch, keeping the soil moist and the young grass roots protected.

That is also true with established lawns, but if the grass is left to grow for some time before each mowing, a large amount of clippings will be left each time. If left to lie, these clippings turn brown and look unsightly, and if the clippings are removed, the basal parts of the plants are likely to be injured by the sudden exposure to sunlight. Therefore a lawn should be mown frequently enough to prevent the production of long blades of grass, thus relieving the gardener of the necessity of removing the clippings.

Leaving the clippings on the lawn is quite safe if the lawn is reasonably free from weeds. If a lawn is heavily infested with weeds, a grass-catcher should be used, as to some extent it checks the spread of and reinfestation by weeds. Recent research work in New Zealand has shown that removing the clippings at least at alternate mowings may be beneficial.



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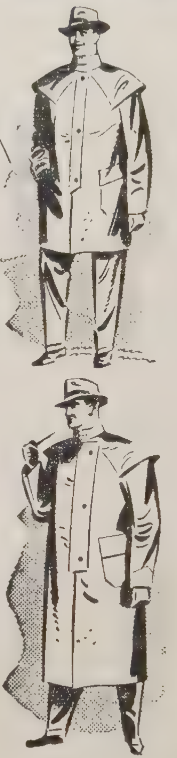

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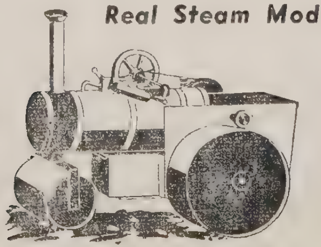

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Value of Rolling

Much argument centres at present around the subject of rolling lawns. Many reasons for rolling have been put forward from time to time, the chief ones being to firm the soil about the grass roots and to encourage capillary action in bringing up water supplies from the soil below the plant roots. In the colder inland parts of New Zealand where frosts are frequent and severe during winter, rolling for the first reason would seem fully justified and is recommended during early spring.

Rolling does not, as many people believe, level uneven surfaces, but simply brings about uneven soil conditions which ultimately result in a patchy turf. For levelling out depressions there is no substitute for topdressing.

If a roller is used, its weight need not be more than 150lb. Under most conditions a roller heavier than this causes the surface to become hard and almost impervious to water.

Aeration of Turf

On well-constructed lawns it is not often necessary to assist aeration of the turf by artificial means. However, the soil of many lawns is hard and impervious and the turf is failing to maintain a healthy condition. In such cases deep spiking with a garden fork may do much to improve the situation. The tines of the fork are pushed as far into the ground as they will go, wriggled a little to make the holes wider, and withdrawn. This allows rapid penetration of air and water, as well as allowing fertilisers to reach the grass roots more quickly.

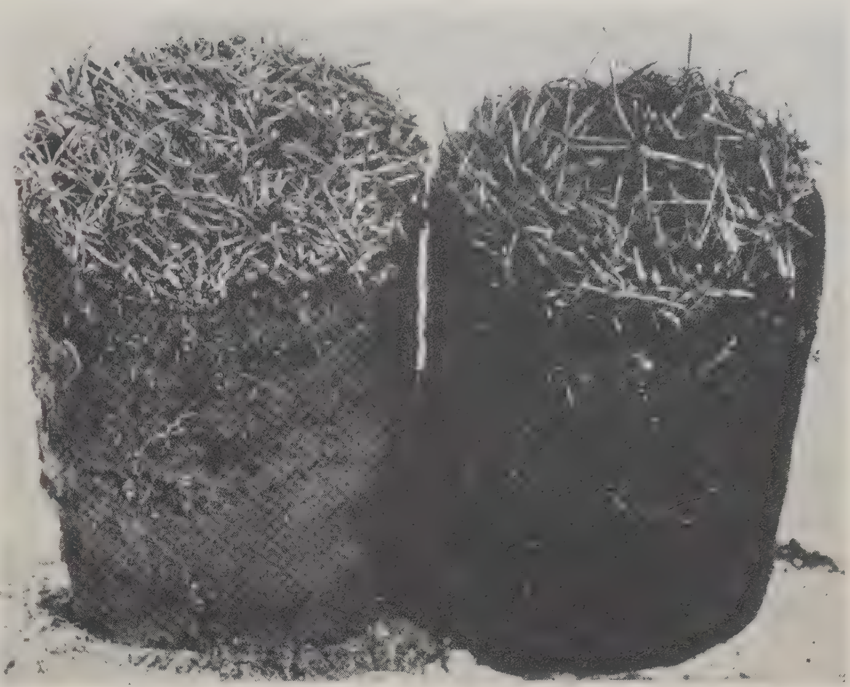
A wide range of spiking and coring machines is manufactured for use in the aeration and general improvement of larger areas of grass.

Watering Lawns

Watering is probably the most important factor in maintaining a good lawn. Without adequate water lawn grasses will not thrive. Admittedly, established grasses do not seem to be permanently injured by periods of drought, but during those periods they do look unsightly, and the only way to have a good green lawn throughout the year is to water it regularly during dry spells.

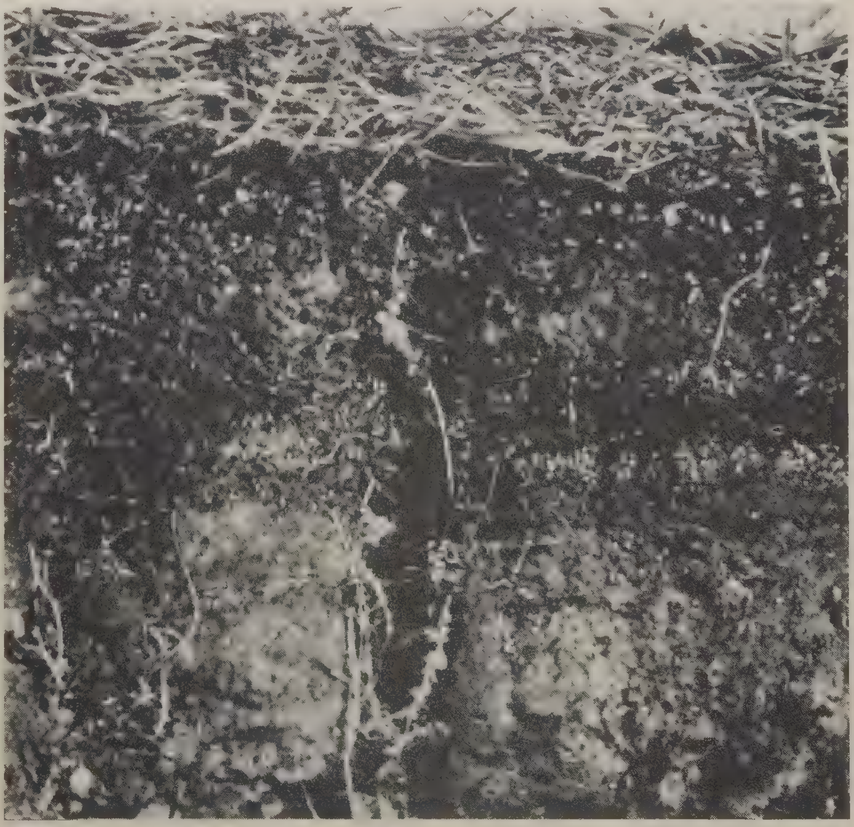
When watering becomes necessary it is essential that it be done thoroughly. All too often the gardener plays a hose over the lawn and imagines that in 5 minutes he has done some good, whereas in fact he need not do this very often to cause quite a measurable degree of harm. Light watering moistens only the uppermost soil region and, because of the presence of water, the grass roots tend to develop there and are not encouraged to penetrate more deeply. The condition gradually deteriorates until all the roots are in the uppermost inch or so of soil, and the turf loses almost entirely its resistance to drought and suffers at the slightest dry spell.

A lawn which is being watered should always receive enough water to wet the soil to a depth of at least 6in. In this way the grass roots are kept well down in the soil and water need not be applied so frequently.



[From "Practical Lawn Craft," by R. B. Dawson (Crosby Lockwood and Son, Ltd., London).

The benefits to turf of aeration. Above—The sample on the left was taken from unforked turf and that on the right from immediately round a fork hole. Below—The development of new roots in a fork hole.



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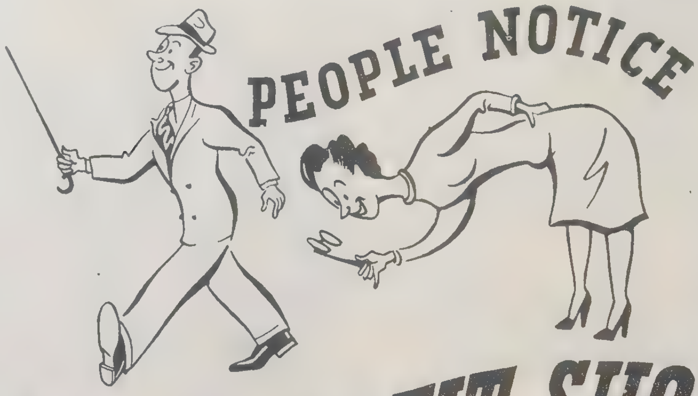

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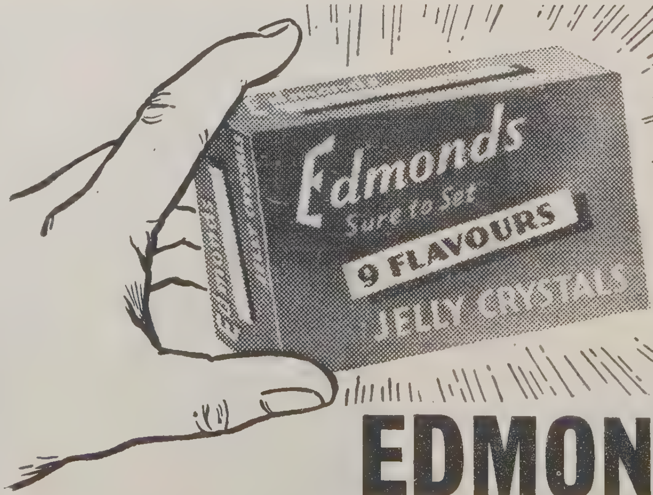

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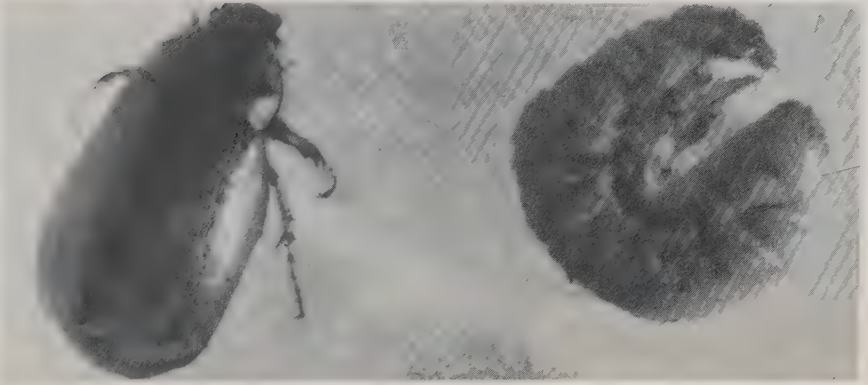
The time of day is not important in watering lawns; in early morning or evening evaporation rates may not be as high as at other times, but this is so small a factor that it may be disregarded. Watering a lawn in full sun is not harmful.

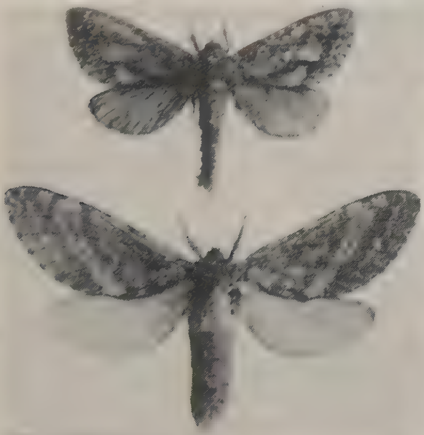
A good variety of water-sprinkling equipment is available to the home gardener at very reasonable cost, and some equipment of this nature cannot be regarded as anything but a good investment.

Insect Pests of Lawns

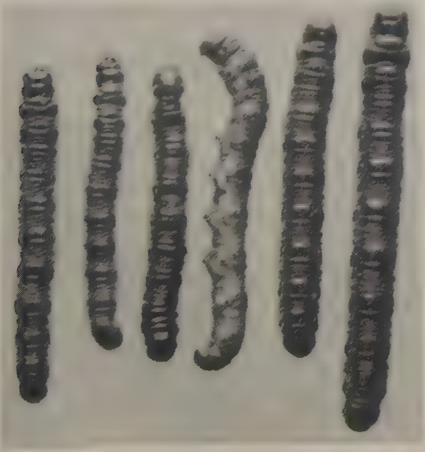
The grass-grub *(Odontria zealandica)* is probably the most harmful of all insect pests which attack lawn grasses in New Zealand. The adult form of the grass-grub is the well-known brown beetle, which is about ½in. long and brown, with darker margins on the wing cases. It has only a few hairs, these being along the sides of the body. The beetles are nocturnal in habit and feed on the foliage of a very wide variety of plants, including many ornamental species. There is normally only a single brood each year, the adults being found usually during November, December, and January. Normally the the female lays eggs at the bases of grass and other plants, and these hatch to grubs in 9 to 11 days, burrow below the surface, and begin feeding on the roots of many plants. In the depth of winter they cease feeding, burrow down a few more inches, and build a smooth-walled cell in which they lie until about August. Then they ascend and feed again, growing to full size, and finally, after a pupation period, emerge as beetles. Control is difficult, especially of the grubs. D.D.T. (1lb. of 50 per cent. wettable D.D.T. per 100 gallons of water) is a useful spray for foliage to minimise the damage done by beetles and to reduce their number. Arsenate of lead powder, at the rate of 2lb. to 400 sq. ft., applied with a spreader of sand, is useful to proof the soil against grubs when a new lawn is being laid down. On established lawns arsenate of lead powder applied broadcast at the rate of 5lb. to 1000 sq. ft. proofs the grasses against infestation for about 3 years.



[Department of Scientific and Industrial Research photo.
The adult grass-grub or brown beetle (left) and its larval stage (right), at which it can cause great damage to lawns.



The subterranean caterpillar. Above—The adult form. The male (upper) is noticeably smaller than the female. Below—The larval stage, at which the caterpillars are injurious to lawns.



Porina "grubs" or subterranean caterpillars are the larval forms of the large native nocturnal moth illustrated on this page. These moths are active during spring and summer. The caterpillars, which are voracious feeders, emerge by night and feed on the surface. The caterpillars are grey-black with black heads. They may be 2½ to 3in. long when fully grown, and they burrow holes in the turf from which they emerge at nightfall to feed on the grass foliage. Extreme damage caused by this pest is not usually apparent until autumn or early winter, when the grasses may die as the direct result of almost complete defoliation. In bad cases the soil surface appears to be perforated with holes about the diameter of a pencil. Poison baits have been found most effective in controlling this pest; 2lb. of wheat bran mixed thoroughly with 2oz. of arsenate of lead powder or 1oz. of Paris green, moistened slightly, makes sufficient to broadcast over 1500 sq. ft. The application should be made on a fine, warm evening. Both arsenate of lead and Paris green are extremely poisonous substances and the greatest care should be exercised in using them, especially where there are children or pets. The baits are best applied during January, and repeated in February if the attack is serious. An alternative to the laying of baits is the application of "Gammexane" (benzene hexachloride) in powder form at 2oz. per square yard. These larvae, like grass-grubs, are largely inactive during winter and begin to emerge in spring as adults.

Control of Weeds in Lawns

Probably the most widely used of the chemical treatments for lawn weeds in past years has been a mixture of sulphate of iron and sulphate of ammonia. Sulphate of ammonia in itself used regularly in small quantities deters many weeds, but the addition of a third of its weight of sulphate of iron assists its action on weeds. This combination of chemicals should be used at the rate of 1oz. per square yard and sprinkled over the grass in the early morning while the dew still lies and when there are prospects of a good day to follow. Should hot, dry weather follow an application, burning of the lawn may result. In such a case no further application should be made until the grasses are quite green again. Up to 6 applications at 10-day intervals may be needed to clean up a very weedy lawn. Pearlwort, chickweed, and pennyroyal are comparatively resistant to this mixture, but catsear, plantains, dandelions, and clovers can be eradicated by its use. A pinch of the mixture placed on the crown of a large rosette weed will produce the desired effect.

The selective weedkiller 2, 4-D (dichlorophenoxyacetic acid) is a hormone or plant-growth regulating compound which, when applied at a certain concentration, destroys a wide variety of broad-leaved weeds but does not injure the grasses. The fact that it kills not only the leaves and stems but also the roots makes it more efficient than most weedkillers in that it prevents regeneration. A few weeds are resistant to 2, 4-D, but it checks their multiplication by preventing them from setting seed.

The chemical is reasonably cheap and is safe and easy to apply. Many proprietary preparations of 2, 4-D are available. Concentrations may vary, so they should be applied strictly according to the instructions of the manufacturer. The concentrations are usually 1000 to 1500 parts to a million of water, and sprays at this concentration are applied at 1 gallon to every 200 sq. ft. to give effective control of most weeds.

A fine spray that completely covers the lawn and wets weed leaves can be obtained with a knapsack-type sprayer. Calm conditions are desirable, for wind-blown spray may do considerable damage to ornamental plants in nearby borders and beds. A few days after being sprayed the leaves of the weeds begin to twist and curl in a peculiar manner and death soon follows. Killing is most rapid and effective when the weeds are growing actively or when they are soft and succulent.

A sprayer used for applying 2, 4-D should not be used for any other purpose until the residue in the equipment is removed completely, otherwise severe plant damage will result.

To remove the residue fill the tank with hot water, rinse it thoroughly, pump some through the system, and drain it. Fill the tank almost completely again with hot water and add 1 part per 100 of household ammonia. Agitate the whole equipment violently and pump the solution through the entire system. Drain the pump and rinse it with hot water. The treatment with ammonia is now repeated, but instead of the solution being drained off it is allowed to stand in the equipment for 24 hours. After this period the system is drained and rinsed thoroughly with fresh water.

Garden Work for November

Annuals can still be sown if the soil is not too dry, but late sowings often give uneven germination and poor growth. For late flowerings, orange and yellow calendulas should now be sown in boxes and the seedlings pricked out into other boxes as soon as they can be handled. They may be planted out to the borders early in the new year. Though calendulas are moderately resistant to drought conditions, they should be watered thoroughly before they are planted out.

Bedding plants such as petunias, marigolds, salvias, asters, stocks, phlox, and zinnias can still be planted out this month. If the soil is dry, it should be watered thoroughly the day before planting takes place, and in such a case it is unwise to firm the soil too much when planting for fear that it should set hard.

Bulb foliage should not be cut off until it turns completely brown. In this state it is quite useful for the compost heap. In early districts tulips and daffodils may be dug up and put in an airy shed to dry off. Tulip bulbs should never be left in sunlight, as high temperatures may restrict their proper development. Tulips should be lifted every year unless they are planted very deeply. Daffodils need be lifted only every second or third year.

Syringas or lilacs are among the shrubs which flower on shoots produced the previous season and should be pruned as soon as flowering has ceased.

Chrysanthemum planting should be concluded, even in the latest districts, by setting out well-rooted plants of a variety suitable for border display. The soil should be well dug and enriched with compost or manure before plants are set out.

Dahlias may well be planted out in cold districts where early planting is unwise, and in milder districts late pot tubers may be planted during November to give colourful display after the main crop has passed. Earlier plantings in mild districts will now be growing strongly and, if necessary, should be thinned by the removal of a number of the young shoots. These may be cut with a sharp knife, but pulling them away gently with the fingers may be found a better method in that it removes also the lower buds on the stems and prevents further growth from these buds. At later stages staking will be necessary, and each stake should be almost as long as the flowering stem, so that the flower when produced is only slightly above the top of the stake. The stems should be tied to the stakes with twine so they are unable to twist about in the wind and break off.

Gladioli, which will be growing strongly in early districts, should be staked unless they are very well sheltered. Each stake should be pushed into the ground 2 or 3in. behind the plant and each spike tied only loosely. Very firm tying may bruise the stems and restrict their growth.

Hedges should be given their first clip of the season as soon as early growth makes them appear untidy. Provided the clippings are clean, they are a useful addition to the compost heap.

Mulching of camellias, hydrangeas, rhododendrons, and azaleas during November with well-rotted compost, sawdust, or leaf mould helps to conserve moisture and maintain suitable soil conditions. Should the soil be dry, it should be watered thoroughly before the mulch is given.

Pot-grown fuchsias and heliotropes should be planted into the massed flower border to add interest to the general bedding scheme. They will flower for many weeks during summer.

Shrubs which flower in spring and early summer on shoots produced the previous season, such as flowering currants, forsythias, and lilacs, should be pruned as soon as flowering has ceased. Removing the shoots which have flowered encourages the growth of ample new ones which will produce flowers next spring.

Diseases and Pests

Geranium rust ruins many geraniums each year by causing rusty brown spots on the foliage. Fortnightly spraying with 2 fl. oz. of lime sulphur and ½ fl. oz. of colloidal sulphur to 2 gallons of water controls this disease. Before the plants are sprayed badly affected leaves should be picked off and burnt. Where the geraniums are growing against a house care must be taken with sulphur sprays, for they discolour paintwork readily.

Greenflies are prevalent in many gardens and attacks on them should be continued by spraying at 10-day intervals with nicotine sulphate until they have disappeared.

Red spiders attack a wide variety of pot plants and a careful watch should be kept for them from now on. The most efficient control measure is spraying with summer (white) oil or nicotine sulphate. If few plants are to be treated, most of the red spiders can be eliminated by holding the plants upside down beneath a fast-running cold-water tap. The treatment should be repeated at frequent intervals until there is no further sign of the pest.

Rhododendrons are often attacked during summer by thrips which cause the leaves to assume a silvery appearance. The best spray against this pest is one containing D.D.T., which is very effective when applied at the rate of 2lb. of 50 per cent. wettable D.D.T. to 100 gallons of water.

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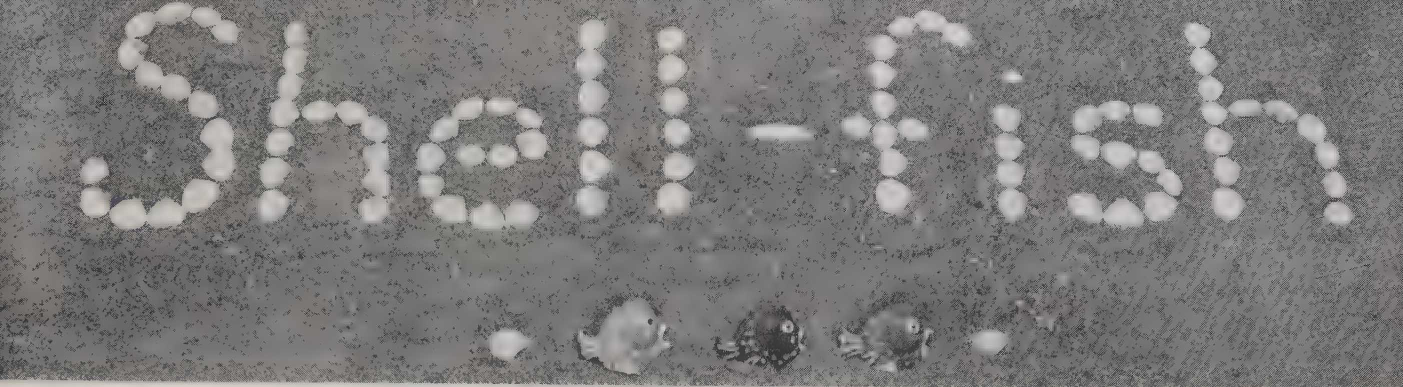

Recipes and Methods of Preparation

NEW ZEALAND has available a comparatively rich source of food in shell-fish. With a long coastline much of which is easy of access, many New Zealanders are able to obtain some of the more common shell-fish such as pipis and mussels when the fancy takes them. Shell-fish readily obtainable in the shops include oysters (either rock or South Island) and the packhorse species of crayfish, and in certain areas it is also possible to obtain toheroas, cockles, crabs, scallops, and the fresh-water lobster. This article describing a variety of ways in which shell-fish may be prepared and cooked is by Nell Macpherson, Rural Sociologist, Department of Agriculture, Auckland, who adds a warning that care must be taken to ensure that shell-fish are quite fresh and have been taken from an unpolluted beach.

SHELL-FISH are a good source of iodine and a fair source of vitamin B_1, but they appear so infrequently on menus that their contribution to the general diet is not important.

Most shell-fish can be eaten all year round, though there are some, such as oysters and toheroas, which can be taken only at certain seasons to conserve their numbers. The old superstition that shell-fish should be eaten only when there is an "r" in the month is meaningless. In the height of summer shell-fish deteriorate rather quickly; if they must be kept, especially where humidity is high, a very cool storage place—preferably a refrigerator—is essential.

Crayfish

Crayfish may be used in a variety of ways, and most of the recipes given in overseas cookery books may be applied in New Zealand by substituting the native crayfish for the lobster or crab given in the recipe.

When preparing crayfish always remove the cord, which is dark and runs through the centre of the tail. Crayfish can be served hot or cold, but for hot dishes rather less seasoning is needed.

The medium white sauce required in the crayfish thermidor and scalloped crayfish recipes is made by blending 4 tablespoons each of flour and melted butter and gradually adding 2 cups of milk, stirring to prevent lumps forming. The sauce is then cooked over low heat until it is smooth and thick.

CRAYFISH SALAD

[*Photographs on this page by Sparrow Industrial Pictures Ltd.*

Crayfish Thermidor

2 cups of medium white sauce
1 tablespoon of chopped parsley
1 large crayfish
Salt, pepper, and paprika (red pepper)

Remove the soft underskin on the tail of the crayfish. Remove the flesh and wash it in cold water. Wash the shell under cold running water. Heat the flesh in the white sauce. Add the parsley and salt and pepper to taste. When the mixture is hot fill the shell with it. Sprinkle paprika on top and brown it in the oven. (Six to eight servings.)

This recipe may be varied by adding chopped onion to the filling mixture; using chives instead of parsley; using small crayfish instead of a large one, each crayfish then making an individual serving; or adding 2 tablespoons of grated cheese to the mixture.

Scalloped Crayfish and Eggs

4 hard-boiled eggs, sliced
2 cups of medium white sauce
1 cup of crayfish flesh
1 tablespoon of chopped parsley
½ cup of breadcrumbs

Combine the egg slices, crayfish, parsley, and white sauce. Pour the mixture into a greased casserole or pie dish, cover it with breadcrumbs, and bake it in a hot oven (400 degrees) until the crumbs are brown—about 15 minutes. (Four servings.)

Curried Crayfish

1 medium-sized crayfish
1 onion
½ tablespoon of curry powder
Salt and pepper to taste
2oz. of butter or fat
½ tablespoon of flour
1 pint of milk

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SHELL-FISH RECIPES

Remove the flesh from the crayfish and cut it into pieces. Mince the onion and cook it in the fat until it is soft but not brown. Add the flour, curry powder, salt, and pepper. Mix them smoothly and then add the milk gradually. Cook the mixture until it is smooth and thick. Add the cut-up crayfish flesh and stir the curry over heat until it almost starts to boil. Serve it with plain boiled rice if it is available. (Six servings.)

A pinch of cayenne pepper or the grated rind of ½ lemon and 2 tablespoons of juice may be added.

Crayfish a la Newburg

This is a special way of preparing lobster which is famous in the United States of America.

4 tablespoons of butter or fat
1 tablespoon of flour
2 cups of crayfish meat
½ teaspoon of salt
Pepper and a pinch of cayenne pepper
½ cup of top milk
2 egg yolks beaten in ½ cup of milk
Lemon juice

Melt the fat and add the flour, stirring until it is smooth. Add the crayfish, salt, pepper, cayenne pepper, and top milk. When the mixture is smooth and thick gradually add the beaten egg yolks, stirring constantly. Add lemon juice to flavour and serve the crayfish on toast. (Six servings.)

Crayfish Fritters

2lb. of crayfish flesh cut into pieces
1 cup of flour
½ teaspoon of sugar
1 egg
2 tablespoons of butter
1 teaspoon of baking powder
½ teaspoon of salt

Make a batter by sifting the dry ingredients into a bowl, adding the egg, melted butter, and 1 cup of water, and beating them together until the mixture is smooth. Dip the pieces of crayfish into the batter and coat them thoroughly. Fry the crayfish in deep, hot fat until it is golden brown, drain it on crumpled paper, and serve it hot or cold with wedges of lemon.

Crayfish Salad

1 medium-sized crayfish
1 hard-boiled egg
1½ tablespoons of flour or 2 tablespoons of cornflour
1 tablespoon of sugar
2 eggs
1 small cup of vinegar
2 tablespoons of butter
1 teaspoon of dry mustard
½ teaspoon of salt
1 cup of milk

Dressing: Melt the butter, stir in the flour, add the milk gradually, and cook the mixture until it is smooth and thick, stirring continually. Beat the eggs, mustard, vinegar, sugar, and salt together, add them gradually to the cooked mixture, and heat it just to boiling. Remove the egg yolk from the white and sieve it into the dressing. Cut the white into rings or spears and use them for garnishing.

Remove the meat from the shell of the crayfish and cut it into pieces; keep the legs aside. Mix the pieces with the dressing and serve the salad in lettuce cups with the legs, on ice if possible. Garnish it with spears or rings of egg white, radish flowers, and celery curls, or tomato segments and pickled gherkin.

[*Sparrow Industrial Pictures Ltd. photo.*

Crayfish Cocktail

2 small crayfish
1 cup of tomato sauce
Lemon slices
1 tablespoon of Worcestershire sauce
Parsley

Remove the flesh from the crayfish, cut it into long, narrow pieces, and place them in glasses or a round bowl. Mix the Worcestershire and tomato sauces and cover the crayfish pieces with them. Serve the cocktail with slices of lemon and sprigs of parsley.

Lobster or crayfish may be used in many other ways—in souffles, omelets, pie fillings, savoury fillings, and aspic. Crabs can be used in the same way. For the experienced and experimental cook the variety of dishes which may be made is almost limitless.

Oysters

Though oysters are perhaps an acquired taste, once the taste has been acquired they can be used in many delightful ways, either as the main dish for a meal or as a delicious snack for supper.

Most oysters sold in shops are already prepared for eating, but if they are obtained in the shell, they must be opened, washed, and bearded. They can be opened by inserting a sharp knife between the shells on the valve side and cutting through.

Oysters on the Shell

Use the deeper halves of the shells. Place a single, raw, cleaned oyster on each. Serve them with lemon slices or wedges, tomato sauce, or horse-radish sauce.

Oyster Stew

1 dozen oysters and liquor
1 tablespoon of butter
1 tablespoon of flour
½ cup of milk
Salt and pepper

Melt the butter and blend the flour into it. Add the milk and oyster liquor gradually, stirring the mixture over the heat until it is thick and creamy. Add salt and pepper to taste and then the whole oysters. Bring the stew quickly to the boil, stirring constantly. Lemon juice or vinegar can be added if desired. (Two or three servings.)

Oyster Balls

1 cup of mashed potatoes
1 tablespoon of milk or oyster liquor
1 dozen oysters
1 tablespoon of butter
Salt and pepper

Beat the potatoes, milk, butter, and seasoning together with a fork or wire whip. When the mixture is light and fluffy form it into pats. Place 2 oysters on each pat and roll them into a ball. Bake the balls on a greased slide in a moderate oven until the potatoes are golden brown. Put a sprig of parsley on each cooked ball. (Two or three servings.)

Pigs in Blankets

Dry 1 dozen large oysters and roll a half slice of bacon round each. Fasten them with toothpicks if necessary. Place them on a rack in a dish and bake them until the bacon is crisp. Remove the toothpicks and serve the savouries hot on toast. (Two or three servings.)

Oyster Chowder

1 dozen oysters and liquor
1 tablespoon of butter
1 cup of milk
½ cup of chopped celery

Boil the celery in a little water until it is tender. Strain off the water into a saucepan with the milk and oyster liquor. Bring the liquid to the boil, add the butter, and season it to taste. Add the celery, chopped oysters, and, if desired, green peas or slices of raw tomatoes. Serve the chowder with crackers.

Oysters may also be used as sandwich and patty fillings and in souffles, soups, cocktails, and fritters. They make a delicious filling in celery boats.

Toheroas

Toheroas are peculiar to New Zealand and, in fact, toheroa soup is regarded as New Zealand's national soup. They are difficult to obtain in the raw state and are rather tougher than most shell-fish, so they are most often made into stew or soup, though they make rather tasty fritters if they are minced.

Raw toheroas should be warmed in water to open them so that the sand falls out, then removed to clean water and boiled. This also helps to keep them fresh.

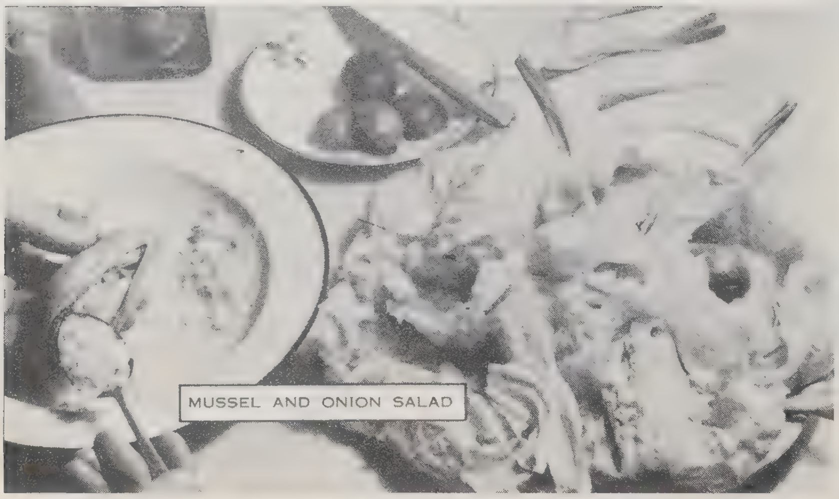
Toheroa Fritters

6 toheroas
1 cup of flour
1½ teaspoons of baking powder
1 teaspoon of salt
1 egg beaten in 1½ cups of milk
1 tablespoon of melted fat

Batter: Sift the dry ingredients and add the egg and milk and the melted fat. Beat the ingredients only long enough to mix them; the batter should still be slightly lumpy. The recipe given for crayfish fritters may be used if it is preferred.

Mince the toheroas after washing them and add them to the batter mixture. Drop spoonfuls from a dessertspoon into shallow fat and cook them gently for 3 to 4 minutes on each side. Drain them on absorbent paper and serve them with parsley and lemon juice. (Four to six servings.)

SHELL-FISH RECIPES



[*Sparrow Industrial Pictures Ltd. photo.*

Scrambled Toheroas

6 toheroas
2 or 3 eggs
1 teaspoon of butter
Salt and pepper

Simmer the toheroas gently in enough water to cover them until they are tender, then strain them. Beat the eggs and gradually add the liquor strained from the toheroas. Cut the toheroas into large pieces and add them. Cook the mixture over gentle heat until it is set. Add the butter, salt, and pepper and serve it on toast. (Four servings.)

Toheroa Stew

6 toheroas
1 onion
1 tablespoon of fat
½ tablespoon of flour
½ cup of milk
Salt to taste

Melt the fat and cook the onion in it until it is tender but not brown. Add the salt, cut-up toheroas, and water to cover them. Simmer the toheroas until they are tender. Thicken the stew with the flour and milk. Green peas and young carrots make a pleasing addition. (Four servings.)

Toheroa Soup

6 toheroas
3 pints of milk
1 onion
Salt and pepper

Wash and mince the toheroas, mince the onion, and add both to the boiling milk. Simmer them for 2 hours. Add salt and pepper to taste. Thicken the soup with a little cornflour if desired and serve it with croutons.

Mussels

Mussels are available from fishmongers in most large towns and can be dressed up with sauces to make really enjoyable dishes if the family likes them hot. They also merge gracefully into salads and are really more satisfactory for salads than oysters, as they are larger. And, of course, they can be collected at the beach and boiled in sea-water, when they are perhaps most delicious.

Mussels can be opened by placing them in boiling water.

Curried Mussels

2 dozen mussels
2 onions
½ tablespoon of curry
½ tablespoon of flour
2 tablespoons of butter
Salt and pepper

Melt the butter, add the sliced onions, and cook them gently until they are golden brown. Add the flour, curry, and sufficient water to mix them smoothly. Add the mussels and, if necessary, more water until the mussels are just covered. Season the curry and cook it slowly for 30 minutes.

Fried Mussels

Allow 5 mussels per serving. Beat an egg lightly and mix it with an equal quantity of water. Roll the mussels in oatmeal, then in the egg mixture, and then in oatmeal again. Fry them in deep fat, drain them on absorbent paper, and serve them with Worcestershire sauce.

Fricassee of Mussels

8 mussels
1 tablespoon of fat
1 wineglass of white wine
1oz. of flour
½ pint of fish stock
2 tablespoons of top milk
Juice of an orange
Pinch of mace
Salt and pepper

Melt the fat and blend the flour with it. Add the fish stock gradually, stirring to prevent lumps, then add mace, salt, and pepper to taste. Cook the mixture until it is thick, then add the top milk and wine. Put in the mussels and simmer them for 10 to 15 minutes. Stir in the strained orange juice, and serve the fricassee immediately. (Four to six servings.)

Mussel and Onion Salad

12 mussels
3 pickled onions
2oz. of cheese
Lettuce leaves
6 spring onions
Walnuts
1 tablespoon of Worcestershire sauce
1 cup of mayonnaise

Wash and cook the mussels and allow them to cool. Grate the cheese, chop the walnuts, and mix them. Spread the mixture on 6 of the mussels and place the other 6 mussels in the manner of sandwiches, or split each mussel and fill it. Arrange the mussel sandwiches on lettuce leaves and top each sandwich with half a pickled onion; if preferred, the pickled onions may be chopped and sprinkled on the sandwiches. Arrange the lettuce leaves on a plate in a circle and in each space put a spring onion, bulb end out. Serve the salad with mayonnaise to which the Worcestershire sauce has been added. (Six servings.)

Mussel and Carrot Salad

2 mussels, cooked
1 small carrot
1 small onion
1 lettuce leaf
2 tablespoons of shredded cabbage
1 tablespoon of mayonnaise

Grate the carrot and chop the onion and mussels finely. Mix them with the mayonnaise. Arrange the cabbage in the shape of a nest on the lettuce leaf and place the mussel mixture in the nest. (One serving.)

Mussel and Onion Pie

12 mussels
2 onions
1 tomato (if desired)
½ tablespoon of cornflour
½ cup of milk
Mashed potatoes

Chop the mussels, slice the onions, and place them together in a casserole with enough water barely to cover them. Cook them slowly until the onions are tender. Strain off the liquor and thicken it with the cornflour and milk. Pour it back over the mussels and onions. Spread mashed potato over the top of the mixture and slice a tomato over the potato. Return the pie to the oven and cook it gently until the tomato slices are just tender but not wrinkled.

Pipis

Pipis are seldom bought in a shop but are usually acquired on a picnic excursion. They may be used in the same ways as mussels and oysters. As they are smaller than mussels, more need to be used in the recipes; the usual allowance is two pipis to one mussel.

Pipis are usually opened by being heated in water. If they are going to be cooked later, they need not be boiled, but otherwise they are better boiled. Place them in a frying pan with just sufficient water to prevent them sticking. As the shells open, remove the pipis and allow them to cook thoroughly. Shake a little pepper over them and add a nut of butter just before serving them.

Pipi Souffle

1 cup of chopped pipis
3 eggs
1 cup of milk
3 tablespoons of fat
3 tablespoons of flour
¼ teaspoon of salt

Make a thick sauce by melting the fat, adding the flour and cooking it until it is smooth, then adding the milk gradually, stirring to prevent lumps forming. Cook the sauce until it is thick.

Add the pipis to the white sauce and mix them thoroughly. Cool them slightly and add the beaten egg yolks. Beat the egg whites until they are stiff and fold them into the mixture. Pour the mixture into a greased baking dish, filling it not more than two-thirds. Set the dish in a pan of hot water and bake the souffle at 350 degrees for 45 minutes to 1 hour.

Scallops and Cockles

Though they are seldom seen in a shop, scallops are obtainable at some beaches. When they have been removed from the shells they are prepared by cutting off the beards and removing the black spots. They may then be eaten raw or used in the same ways as mussels.

Cockles are usually heated in water to remove them from their shells. Because they are small and not available elsewhere, they are more of a "picnic at the beach" treat.

RURAL DOMESTIC ECONOMY INSTRUCTION IN ENGLAND

By
NORMA K. METSON,
Rural Sociologist,
Department of Agriculture,
Wellington.

Farming is still a major industry in England, and this Yorkshire farmhouse and its surroundings are reminders of the fact—sometimes forgotten—that stretches of open country still exist.

SOMETIMES forgotten are the facts that farming is still a major industry in England and that women, as farm owners, as employees particularly in dairy and horticultural work, as farm housewives, and as instructors, make an important contribution to primary production. That was so even before the creation of the Women's Land Army during the First World War, but it was, of course, accentuated then and during the Second World War. In the peak year, 1943, there was 1 woman farm worker to 2 men; by 1947 the proportion had dropped to 1 to 5, but 146,000 women were still employed in this way. Country women individually and through their organisations are responsible also for the production and preservation of large quantities of meat from small livestock and of fruit and vegetables.

INSTRUCTION in rural domestic economy grew out of the Agricultural Advisory Service, which employed a number of women instructors, chiefly for work in dairy farming, horticulture, and poultry keeping. As they visited farms these women were frequently asked by housewives if they could explain why bottled fruit had gone bad, what to do with surplus fruit and vegetables, or how to make the best use of the meat when a pig was killed. From those experiences it became clear that there was a place for a separate instructional service, staffed by women, and directed toward assisting rural women with their special problems.

Development of Service

The nucleus of the new service was formed from the women already in agricultural advisory work who had become interested in the domestic aspects and from others with domestic-science training and an appreciation of country life and its problems. As food conservation and preservation have always been the subjects most emphasised, special short and intensive courses in fruit preservation, domestic buttermaking and cheesemaking, and bacon curing were usually attended by instructors to supplement previous training.

The Ministry of Agriculture research station at Long Ashton has done much to develop safe and standardised methods of food preservation. Their bulletin "The Domestic Preservation of Fruits and Vegetables," giving the scientific principles underlying methods of preservation as well as tested recipes and techniques, and frequently revised to incorporate the latest findings, is very valuable to housewives and teachers. "Dig for Victory" and "Grow More" bulletins and leaflets, brief, simple, and each dealing with only one subject, were distributed extensively during the war.

A reorganisation of agricultural advisory work in 1946 was aimed at equalising funds and facilities available in different counties and coordinating the work with other educational services.

Training Courses

The two new training schools are at Worcester and Writtle. The Worcester property has a 30-acre farmlet and modern buildings, but the demonstration kitchen is in the original farmhouse, so students learn foods work

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under real-life rather than artificial conditions. Those who take a 1-year course at Worcester are already qualified in dairy work, horticulture, or agriculture, so their training and practice are in teaching methods, housewifery, needlework, and household and applied science. The small farm with orchard, garden, cows, pigs, poultry, and rabbits is run as an instructional and not a commercial undertaking and provides the means for a brief specialisation in horticulture, poultry keeping, or dairy farming. In addition, Worcester has a full 3-year course, and those who take this will qualify as teachers of domestic subjects or as Rural Domestic Economy Instructresses.

The training school at Writtle is attached to the Essex Farm Institute, where a full-scale farm is run as a commercial undertaking. The course is again of 1 year, and the students have previously obtained a domestic-science degree or diploma, so attention is concentrated on the rural aspects of the work and on teaching practice. Domestic science, as ordinarily taught, does not include the techniques of home gardening, extensive food preservation, farmhouse dairying, bacon curing, and the care of small stock, and in a country as highly urbanised as England girls without a farm background, though adequately trained in the conventional "domestic science," are unlikely to have the necessary knowledge of rural life and outlook. At Writtle, as the students are living on a farm, they gain some experience of the routine and management of an ordinary holding and the way in which domestic arrangements are dominated by farm practices.

The present courses are regarded as experimental and are to be altered, if necessary, as experience and results suggest. Special short courses of 2 or 3 weeks are still available for those who require a refresher course or an intensive training.

This thatched cottage is centuries old, but has its radio aerial and electric light. Many others are equally picturesque but less well provided with modern amenities.

Work of Instructresses

Rural Domestic Economy Instructresses regard their lectures and demonstrations at group meetings as the most important part of their work. These groups vary widely, and their membership may range from the wives of farm workers in a remote village to suburban housewives on the fringe of a large city whose only experience of the land and its products is cultivating an allotment or saving food scraps for feeding a communal pig. The atmosphere at such meetings is very similar to that at similar meetings in New Zealand, though the women are perhaps more ready to ask questions and join in discussions.

These lectures are not given regularly, but are arranged at the request of groups whenever they are asked for. Organisations which make requests most frequently are Women's Institutes, Village Produce Associations, and women's clubs associated with churches or community centres. If suitable premises are available, regular classes and demonstrations in foods work are held for Farm Institute students, women's club members who wish to obtain cookery certificates, and any other women who may be interested.

A monthly cookery demonstration is featured in some counties. Following is the 1949 list of subjects in one where the demonstration kitchen was at the farm a few miles out from the county town: January, "Variety in Scone Making"; February, "Variety in Fish Recipes"; March, "Thinking Ahead for Easter"; April, "Springtime Suppers. Light and Substantial"; May, "Home-made Cheeses"; June, "Holiday Catering"; July, "Canning of Soft Fruit"; August, "Four Special Preserves"; September, "Canning of Tomatoes"; October, "Harvesting Vegetables and Interesting Ways of Cooking Them"; November, "Cooking of Poultry"; December, "Preparations for Christmas". Topical and seasonal subjects are kept in mind when these programmes are drawn up.

An ancient farmhouse.

DOMESTIC ECONOMY INSTRUCTION IN ENGLAND

Surrey Farm Institute at Merrist Wood, near Guildford.

This kitchen, in a prefabricated building, was equipped as a classroom for cookery and laundry work with tables, sinks, and stoves, and had, as an interesting feature at one end, an alcove 11ft. square fitted out as a model farm kitchen. It had metal cabinets, stainless-steel benches, a small built-in refrigerator, and features specially designed for convenience in a country home such as open trays for vegetable storage, a special low tap beneath the sink for filling buckets, working surfaces in addition to the sink bench, and ample storage room, some of it open so that frequently needed equipment could be reached with the minimum of effort. (Another county, less fortunate, had merely a large room in an old house. Equipment was a sink, a table, cupboards, and, just being installed, a new gas stove. Yet demonstrations were held there, too.)

Outside was a model cottage-garden plot, showing the fruits, vegetables, and herbs which should be included and the best varieties for different uses and to suit local conditions. This was cared for by the instructresses who specialised in horticulture. This centre was staffed by a senior instructor and two who had completed their training recently.

The syllabus of classes and demonstrations offered for groups away from the centre was: Bacon curing and the making of small goods; fruit and vegetable preservation (bottling and canning); making jams, jellies, fruit cheeses, fruit syrups, pickles, chutneys, and sauces; dairy work (utilisation of cows' and goats' milk and making different types of cheeses, butter, and ice cream); preparation and cooking of poultry and rabbits; country home cookery (several subjects, some as in the list of demonstrations given previously); and hints on preparation for produce shows.

Produce Shows

A produce show is rather like a "utility" version of the village flower show. Village Produce Associations are made up of small producers who, by combining and affiliating with county committees, can obtain discounts on seeds and fertilisers, assistance in disposing of surplus produce, and advice on problems of cultivation. Competition at the shows encourages members to aim at a high standard of produce, and publicity is given to the work of the associations. The Rural Domestic Economy Instructress may be called on to judge the home-produce sections and probably takes with her an exhibit of fruit-bottling equipment, specimen jars showing different types of fruits, packs, and containers, or some other display illustrating the uses of home-grown or home-made foodstuffs. Similar exhibits are taken to agricultural shows.

For the 1949 Royal Agricultural Show in Shrewsbury the Village Produce Associations prepared a remarkable exhibit—a model cottage for the rural dweller, with a complete kitchen garden of vegetables, small fruits, and herbs, and livestock (pig, goat, hens, rabbits, and bees—"an essential part of every village holding"). The cottage was furnished, but the interior was used mainly to display the produce of the livestock and garden—hams, bacon, cheese of many types, lard, cream, bottled fruits, jams, chutneys, pickles, home-made wines, honey, vegetables, and meat, providing ample evidence that no one with land available for cultivation need be hungry no matter how severe rationing might become.

Even after the present period of shortages is over, the emphasis on food will probably remain in rural domestic economy work, for, because of tradition and the organisation of English farming, domestic and small-scale production will continue to be important. Also, English housewives, unlike their New Zealand counterparts, appear to maintain a continual interest in cookery demonstrations. However, the demand exists for the development of the work over a wider range of subjects and to a higher degree of specialisation. At present some counties are much more active than others, and it appears that within the present framework the service can grow in accordance with local needs, rather than in a uniform pattern in every county.

The Ministry of Agriculture exhibit, with model vegetable garden, at the Royal Agricultural Show at Shrewsbury.

Hot Tea Dishes are Important for Cold Days

By ANNA M. CHAPMAN, Rural Sociologist,
Department of Agriculture, Dunedin.

IT is important to have a hot, interesting, and appetising meal ready for the children when they come home from school on the many cold evenings throughout the year. The men on coming in from their outside work also enjoy something hot and substantial for tea.

THE dish can be very nutritious and, with careful planning, can help to provide a well-balanced diet for the family. If the earlier meals of the day have been lacking in some necessary food—for example, eggs, cheese, or milk—this can be made up by having a tea dish made principally from foodstuffs which have been lacking, or if protein, for instance, is insufficient in the day's menu, this can be augmented by having a cheese or fish dish for tea.

It is necessary in an economically run home to use up left-overs. These can be made into attractive dishes so that they in no way resemble left-overs and are still appetising and of nutritive value in the diet.

Of the recipes given, the majority are easily and quickly prepared, and many of them, especially those using left-overs, can be made earlier in the day, requiring only heating through before the meal.

Several of the recipes contain a white sauce, buttered crumbs, or tomato sauce, so the basic recipes for these are given first. The white sauces are classified according to their degree of thickness into four different types varying from No. 1 which is very thin to No. 4 which is very thick. The method of preparing all the thicknesses of white sauce and that for tomato sauce are the same.

WHITE SAUCE

	No. 1	No. 2	No. 3	No. 4
Butter or good fat ..	1 tablespoon	2 tablespoons	3 tablespoons	4 tablespoons
Flour	1 tablespoon	2 tablespoons	3 tablespoons	4 tablespoons
Salt	½ teaspoon	½ teaspoon	½ teaspoon	½ teaspoon
Milk ..	1 cup	1 cup	1 cup	1 cup

TOMATO SAUCE

½ cup of tomato puree (sieved)
½ cup of water
or 1 cup of tomato juice
2 tablespoons of fat
2 tablespoons of flour
½ teaspoon of salt

Method of preparing all the sauces: Melt the fat in a saucepan, add the flour and salt, and stir well until they are thoroughly blended (1 to 2 minutes). Remove the saucepan from the heat, add about a third of the liquid, and stir until the ingredients are well blended. Return the saucepan to the heat and as the mixture begins to thicken add another third of the liquid quickly, blend until it is smooth, and then add the remaining liquid. Heat the sauce until it is boiling, stirring it slowly, and cook it for 1 to 2 minutes.

Buttered Crumbs

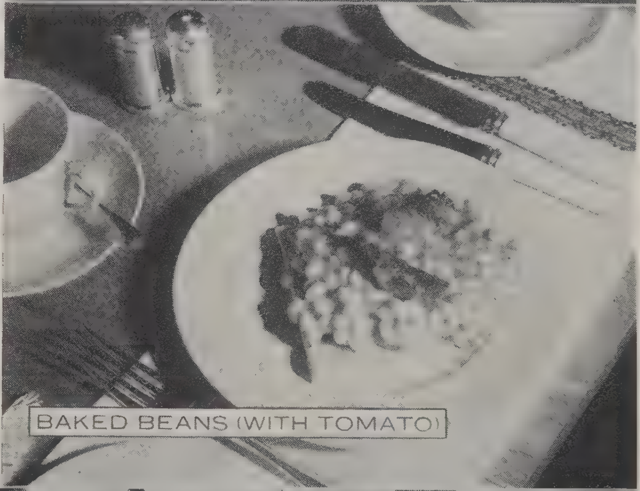
Crumb stale but soft bread with a grater. Melt a small amount of butter or clean fat in a small pan. Stir in the crumbs. When the buttered crumbs are coated with fat but not brown use them as a topping or covering for dishes which are to be browned in the oven.

Soups

Cream of Pumpkin Soup

4 cups of No. 1 white sauce
½ tablespoon of salt
1½lb. of pumpkin
¼lb. of onions
2oz. of celery
Vegetable liquid to make vegetables up to 4 cups

LIVER AND BACON CASSEROLE (WITH APPLES)


BAKED BEANS (WITH TOMATO)

SPAGHETTI RING WITH PEAS

[*Photographs on this page by Campbell Photography.*

HOT TEA DISHES FOR COLD DAYS . . .

Dice the vegetables and cook them in boiling salted water, sieve them, and add sufficient vegetable stock to make 4 cups of vegetable puree. Reheat the puree and then add it gradually to the hot white sauce, stirring all the time. Season the soup if necessary and serve it hot with croutons and chopped parsley.

Lentil Soup

3 cups of No. 1 white sauce
8oz. of lentils
2oz. of celery
3½oz. of carrot
3½oz. of onion
5 cups of water or stock
½ tablespoon of salt
½ teaspoon of pepper

Wash the lentils and prepare the vegetables. Dice the vegetables, add the stock or water and the lentils, and cook until they are tender. Put the mixture through a fine sieve and make it up to 5 cups with extra water or stock. Reheat the puree and add it to the hot white sauce, stirring all the time. Season the soup if necessary and serve it with croutons and parsley.

Fish Chowder

1lb. of white fish
3 cups of cold water
2 slices of salt pork or bacon
1 diced onion
1¼ cups of diced carrot
2 cups of milk
2 teaspoons of salt
4 water biscuits
4 diced potatoes

Wash the fish and cut into cubes, placing the bones and skin in a pot with cold water. Place the pot on the heat and cook the contents for 20 minutes. Strain the liquor from the bones and skin. Cut the pork into small pieces and fry it with the diced onion. Drain the pork and onions well and add them to the hot liquor. Add the vegetables and the diced fish to the liquor. Cook the soup for 20 minutes. Add the milk and the water biscuits, which have been broken into small pieces, and simmer the chowder for another 5 minutes. Serve hot in a soup plate with chopped parsley.

Vegetables

Casserole of Cauliflower

1 small cauliflower
1 cup of tomato sauce
½ cup of grated cheese
2 teaspoons of melted fat
3oz. of spaghetti
½ cup of buttered breadcrumbs

Wash and cook the cauliflower. Cook the spaghetti. Prepare the tomato sauce and add to it the grated cheese. Stir the sauce until the cheese is melted and then pour the sauce over the cauliflower and spaghetti, these having been placed in alternate layers in a casserole.

Cover the top of the mixture with buttered crumbs and brown it in the oven.

Bread Tests for Fat Temperatures

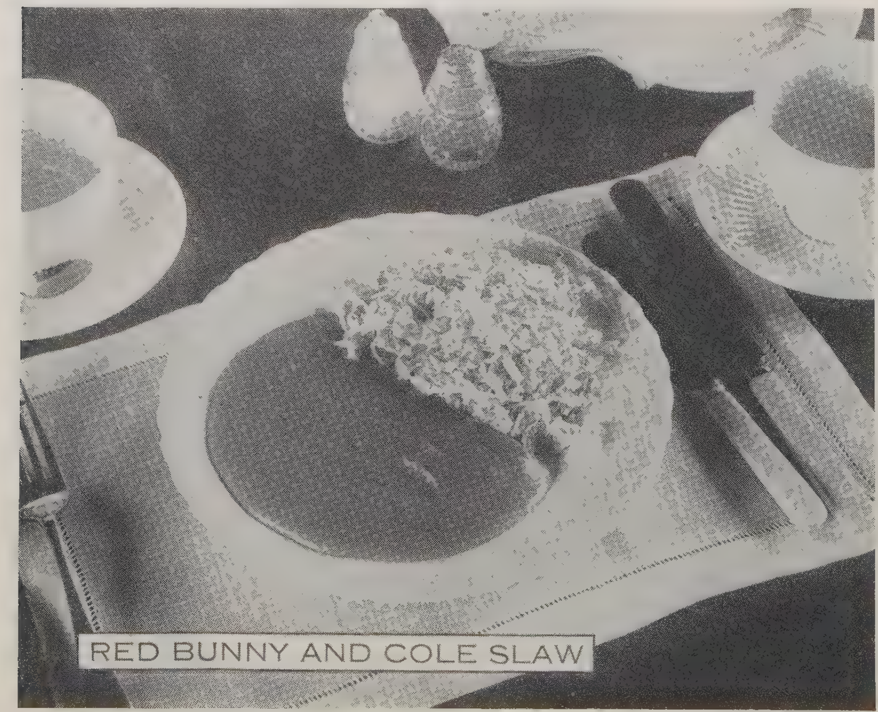
To test fat temperatures if a thermometer is not available, use a 1in. cube of stale bread and note the number of seconds taken to brown it.

Temperature Degrees F.	Seconds to brown	Use
375	60	Cutlets, apple fritters, uncooked mixtures
385	40	Croquettes, cooked mixtures
395	20	Potato chips

Potato Croquettes

1 cup of hot, well-mashed potatoes
1 tablespoon of fat (melted)
A shake of pepper
½ teaspoon of chopped parsley
¼ teaspoon of salt
⅛ teaspoon of celery salt
½ teaspoon of grated onion
1 egg (½ for croquette mixture and ½ for coating)
1 tablespoon of water, breadcrumbs (for coating)

Mix the ingredients in the order given, using only half of the egg. Beat the mixture thoroughly and cool it. Shape the mixture into cylinders and dip them into fine, dry breadcrumbs, then into the egg and water mixture (half an egg diluted with 1 tablespoon of cold water), and then dip them into crumbs again. Stand the crumbed cylinders in a cool place for ½ hour and then fry them in deep fat at 385 degrees F. until they are golden brown. Drain the croquettes well and serve them with tomato sauce.



[Campbell Photography photo.

Savoury Spinach

1lb. or 2 bunches of spinach
1 cup of cooked meat
2 tablespoons of onion juice
1 teaspoon of salt
⅛ teaspoon of pepper
2 cups of tomato sauce
½ cup of cheese
½ cup of cooked rice

Cook the rice. Wash and cook the spinach, chop it finely, and to it add the finely chopped meat, cooked rice, onion juice, and seasoning. Place the mixture in a greased casserole, pour the tomato sauce over it, and bake it in the oven until it is thoroughly hot. Sprinkle it with grated cheese before serving it.

Apple Fritters

1 cup of flour
⅜ cup of milk
1 egg
⅛ teaspoon of salt
1 tablespoon of fat
2 teaspoons of baking powder
2 tablespoons of sugar
Apples

Sift the dry ingredients into a bowl; combine the beaten egg, milk, and the melted fat. Add the liquid to the dry ingredients and stir (as little as possible) until the flour is dampened.

Peel and core the apples and slice them into rings 1/3in. thick. Dip the rings into the batter and fry them in deep fat at 375 degrees F. until they are cooked and golden brown. Drain well. Dust with icing or castor sugar and serve hot.

Fish

Fish Balls

½ cup of cooked flaked fish
1 cup of hot mashed potatoes
1 teaspoon of melted fat
½ teaspoon of onion juice
¼ teaspoon of salt
A shake of pepper
1 egg (½ for fish-ball mixture and ½ for coating)
1 tablespoon of water, breadcrumbs (for coating)

Mix the ingredients in the order given, using only half the egg, and beat the mixture thoroughly. Cool the mixture and shape it into balls. Dip these into fine breadcrumbs, then into the egg and water mixture (half an egg diluted with 1 tablespoon of water), and then into the breadcrumbs again. Stand the balls in a cool place for ½ hour and then fry them in deep fat at 385 degrees F. until they are golden brown. Serve the fish balls with tomato sauce or slices of lemon.

Celery and Fish Casserole

½lb. of fish (groper or cod)
½ head of celery
½ teaspoon of salt
¼ teaspoon of pepper
1 cup of tomato sauce (the flour and fat of which have been increased to 3 tablespoons)
½ cup of buttered breadcrumbs

Steam the fish and, when it is cooked, flake it. Wash the celery, cut it into small pieces, and cook it until it is tender. Place the flaked fish and the cooked celery in a casserole and over them pour the tomato sauce. Cover with a layer of buttered breadcrumbs and bake the casserole in the oven until it is brown and is heated through.

HOT TEA DISHES FOR COLD DAYS

Fish Souffle

¾ cup of cooked flaked fish
3 eggs
A shake of pepper
1 cup of No. 3 white sauce

Separate the yolks and the whites of the eggs. Beat the yolks until they are thick and lemon-coloured and add the beaten yolk to the cooled white sauce. Add the fish to the sauce and egg yolk and then fold the mixture into the stiffly beaten egg whites. Pour the souffle into an ungreased dish and then stand the dish in a pan of hot water and bake in a moderately slow oven at 350 degrees F. for 45 to 60 minutes.

Savoury

Sausage, Apple, and Onion Savoury

1½lb. of sausage meat
1lb. of apples
¾ teaspoon of salt
A shake of pepper
¾lb. of onions

Saute the finely chopped onions lightly. Peel and slice the apples. Partly cook the sausages in the oven to remove some of the fat. Place a layer of apples in a casserole, then a layer of sausage meat, and then a layer of onions and bake in a moderate oven for ½ hour.

Baked Beans (with Tomato)

¾lb. of haricot beans
6oz. of fat bacon
¾lb. of tomato juice or bottled tomatoes
Stock
A shake of pepper
1 teaspoon of salt

Soak the beans overnight. Place layers of beans, bacon, and seasoning alternately in a dish, cover with the stock or water, and cook in a moderate oven for 4 to 6 hours. Serve with thickened tomato juice.

Cheese Casserole

⅛ cup of diced salt pork or bacon
½ cup of cooked diced potatoes
½ cup of diced onion
½ cup of boiled rice
½ tablespoon of melted butter
1 cup of tomato juice
2 tablespoons of flour
1 teaspoon of salt
3 tablespoons of grated cheese

Cook the pork or bacon in a frying pan until it is a light brown. Add the potato and onion and fry until they are brown. Mix the flour to a thin paste with a little of the tomato juice, pour this into the remainder of the tomato juice, which has been heated, and stir until it boils and thickens. Add the cheese and pour over the vegetables. Turn the mixture into a greased baking dish and cover it with rice and butter. Place a lid on the dish and bake in a slow oven for 30 minutes.

Red Bunny and Cole Slaw

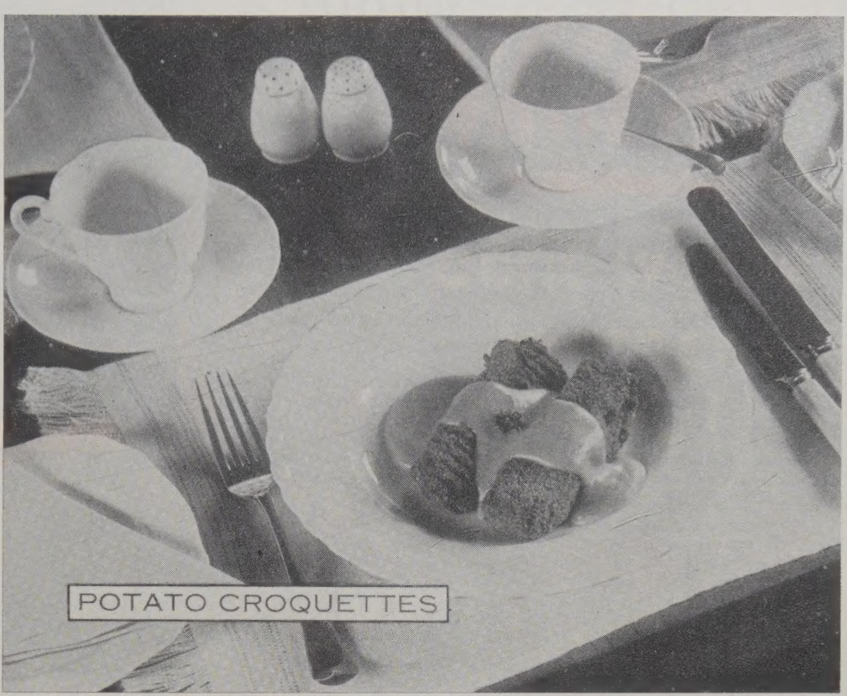
2½ cups of tomato puree
5oz. of cheese
1 cup of No. 4 white sauce
A shake of pepper
2 eggs
¾lb. of cabbage
¼ cup of salad dressing

To the white sauce add the tomato puree, the beaten eggs, and the grated cheese. Cook the mixture in a pot over hot water, stirring it all the time until it thickens. Serve it hot on toast or crackers with cole slaw.

To prepare cole slaw wash the cabbage, slice it very finely, and mix it well with salad dressing.

Liver and Bacon Casserole (with Apples)

1¼lb. of liver
1lb. of bacon
1lb. of apples
¼lb. of onions
½ teaspoon of salt
A shake of pepper
¾ cup of water



[*Campbell Photography photo.*

Wipe the liver with a damp cloth or wash it if necessary. Drain, cut the liver into pieces, flour them lightly, and put them into a greased casserole. Cover the liver with a mixture of chopped apple and onion, add the salt and pepper, and top with the bacon cut into small pieces. Add the water to the dish, place the lid on the casserole, and bake it in the oven for 1½ hours at 350 degrees F. To make the bacon crisp remove the lid of the casserole for the last 20 minutes of baking.

Sausage and Apple Casserole

2 cups of tomato puree
½ teaspoon of prepared mustard
1½ teaspoons of salt
4 cups of thinly sliced and partly boiled potatoes
6 apples
1½lb. of sausage meat

Pour the thick tomato puree into a casserole. Stir in the prepared mustard and the salt and then add the thinly sliced and partly cooked potato. Peel, core, and slice thinly large firm apples, place the apple slices on top of the potato already in the casserole, and then spread the sausage meat on top of the apple slices. Cover the dish and bake at 350 degrees F. for 40 minutes. Remove the lid and cook for a further 20 minutes until the sausage meat is crisp. If the sausage meat is inclined to be fatty, partially cook it first to remove the excess fat.

Bacon, Tomato, and Onion Pie

1 pint of bottled tomatoes
1lb. of onions
3 or 4 rashers of bacon
½lb. of soft breadcrumbs
1 tablespoon of butter or dripping
1 teaspoon of salt

Partially fry the bacon. Grease a pie dish and fill it with alternate layers of crumbs, partially cooked sliced onions, tomato, and bacon, and finish with a layer of buttered crumbs. Bake the pie in a hot oven until it is heated through and the top is brown.

Eggs Tetrazzini

3 eggs
3oz. of spaghetti
4oz. of chopped onion
1 cup of tomato sauce

Slightly fry the chopped onions. Cook the spaghetti in boiling salted water. Hard boil the eggs and cut them into thirds. Add the tomato sauce, onions, and eggs to the spaghetti and heat thoroughly in a double boiler.

Apple Hot Pot

1¼lb. of apples
1¼lb. of potatoes
½lb. of onions
5oz. of cheese
1 teaspoon of salt
A shake of pepper
Water

Place layers of sliced onion, potato, and seasoning in a casserole and add sufficient water barely to cover the vegetables, and bake them in a moderate oven for 1½ hours. Add the sliced apples and grated cheese to the dish and bake it for a further ½ hour or longer until the apples are cooked.

Spaghetti Ring

2 tablespoons of chopped green pepper (can be omitted if not available)
2 tablespoons of chopped onion
2 tablespoons of butter
8oz. of cooked spaghetti
3 eggs
1 cup of tomato soup
1 teaspoon of Worcestershire sauce
1 teaspoon of salt
A shake of pepper
½lb. of grated cheese

Cook the green pepper and the onion in the butter. Add the cooked and strained spaghetti, the beaten eggs, the Worcestershire sauce, the tomato soup, the seasonings, and the cheese.

Pour the mixture into a greased ring mould and bake in the oven for 1 hour at 325 degrees F. Remove the spaghetti ring from the mould and fill the centre with hot cooked peas, beans, or some other vegetable or mixture of vegetables.

Children's Summer Hats

By NELL MACPHERSON, Rural Sociologist, Department of Agriculture, Auckland.

NOW the weather is becoming warmer and children are playing outside again for long periods they need summer hats to protect their faces and necks from the direct rays of the sun. Hats should offer ample protection and yet be easily washed and ironed if possible.

THERE are many kinds of summer hats for children, but print hats which match the clothes have become increasingly popular in the last few years. Various patterns are available in different shapes and with different finishes. The hats illustrated in this article are easy to make and consist of one main piece only and they will open flat for ease of washing and ironing.

Any cotton material is suitable for the hats, and as only ½yd. of material is needed for each, they can be made of the same material as frocks or sunsuits, or even from the skirt of an older child's outgrown frock. The materials needed for the girl's hat are ½yd. of cotton material, cotton thread, and 2 buttons and for the boy's hat ½yd. of cotton material, cotton thread, and 1yd. of each of three colours of cord.

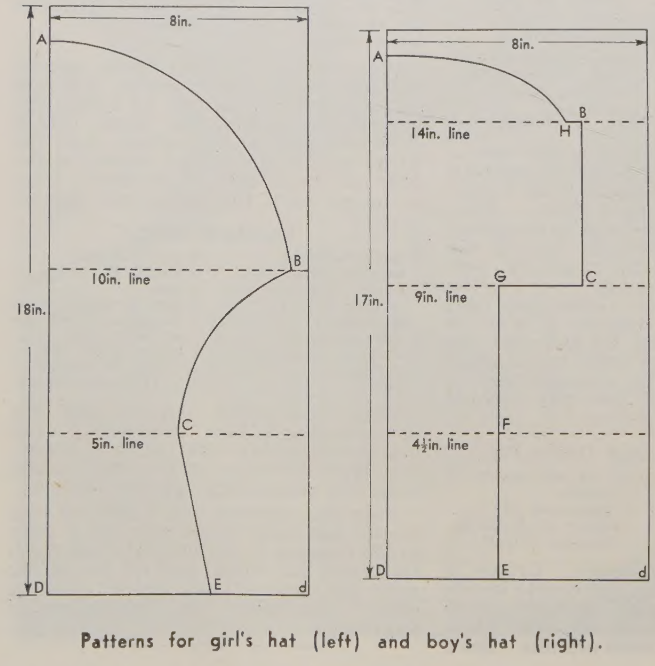
To find the size for the hat it is necessary to make two measurements: One from ear to ear over the crown of the head; the other from the base of the neck over the crown of the head to the forehead. To this second measurement 2in. or 3in. is added for a brim to shade the eyes. In the hats illustrated these measurements were as follows:—

	Girl's hat in.	**Boy's hat** in.
From ear to ear	15	12
From neck to forehead ..	15 + 2	14 + 2

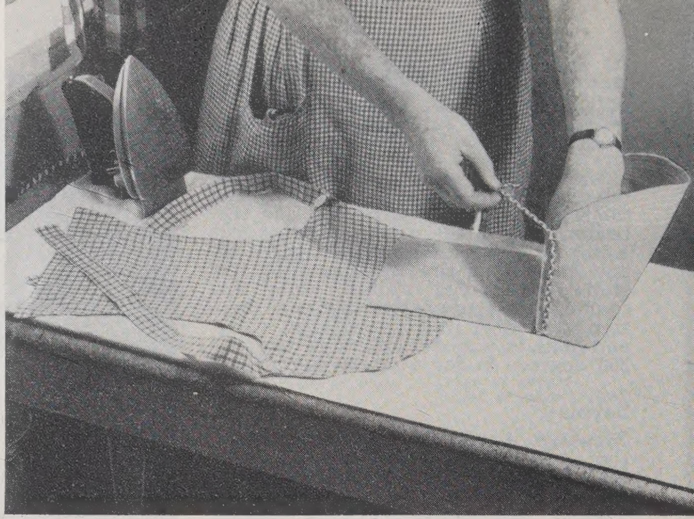
The hats will fit a girl of 3 to 4 and a boy of 1 to 2.

Making the Patterns

Girl's hat: Take a piece of paper 18in. x 8in. Mark off 17in. on one side (point A). Mark off 5in. and 10in. along both sides. Join these marks across the paper with dotted lines.



Patterns for girl's hat (left) and boy's hat (right).



[Sparrow Industrial Pictures Ltd. photo.

The hats opened for ironing; girl's hat (left) and boy's hat (right).

Along the 10in. line mark off 7½in. (point B). Join B and A with a smooth curve.

Along the 5in. line mark off 4in. (point C). Join C and B with a smooth curve.

Along the base line, Dd, mark off 5in. (point E). Join E and C with a straight line.

The resulting pattern is of one half of the hat.

Boy's hat: Take a piece of paper 17in. x 8in. Measure off 16in. on one side (point A). Mark off 4½in., 9in., and 14in. along each side. Join these marks across the paper with dotted lines.

Mark off 6in. along the 9in. and 14in. lines. (Points C and B.) Join C and B with a straight line.

Mark off 3½in. on the base line, Dd, the 4½in. line, and the 9in. line (points E, F, and G). Join E, F, and G with a straight line. Join C and G along the 9in. line.

Mark off 5½in. along the 14in. line (point H). Join H and A with a smooth curve and H and B with a straight line. The resulting pattern is of one half of the hat.

To Cut out Either Hat

Place the straight line AD on the lengthwise fold of the material and pin the pattern on to the material. Allow ½in. for seams and cut out the pattern. Each pattern must be cut out twice. From the material left cut out the ties for the girl's hat.

To Make up Either Hat

Place the two pieces with their right sides together and tack them firmly. Stitch round them by machine, but leave a 2in. opening at the base. Trim the seam allowance carefully, paying special attention to the curves and angles. Turn the right side out and press it flat. Slip stitch the opening at the base of the hat. Then proceed as follows:—

Girl's hat: Five inches from the base of the hat (point C on the pattern) work a buttonhole on each side. Stitch each tie across one end and along the side. Trim the seams and turn the ties inside out and press them. Slip stitch the open ends. Sew one button and one tie to each point of the brim. Time is saved if the button and tie are sewn on in the same action.

Boy's hat: Work loops ½in. long at B, C, and G. Plait the three cords together and thread the plait through the loops. Tie it either over the brim or under the chin.

Stiffening

No stiffening is included in the pattern, because a cotton material will be sufficiently stiff if starched. The peak of the boy's hat and the brim of the girl's hat may be further stiffened if necessary with several rows of stitching (as in the boy's hat illustrated).

The hats may be piped or bound round the edges or may be embroidered. (What little boy would not like a bucking horse embroidered on the tail of his hat?) The girl's hat may also be embroidered around the edge of the brim or it could have a frilled edge. The frilling is stitched in when the pieces of the hat are being seamed together.

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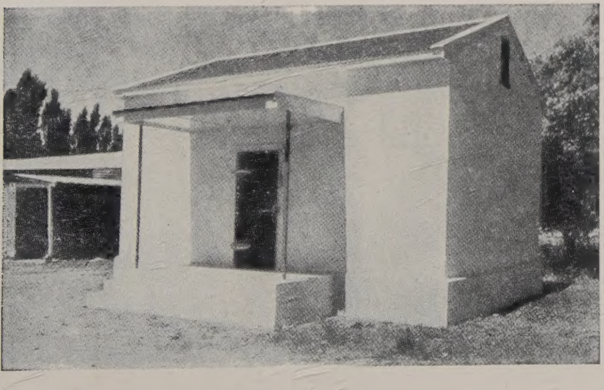

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